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BRIEFLY TOLD.

TAKING MR. OSCAR ZOLLIKOFFER BY SURPRISE.—If the internal history of the movement to establish the old Metropolitan Gas Light Company, of this city, such history to contain also a record of the struggles that the pioneers therein subsequently underwent in their attempts to prove to capitalists that there was room for the new enterprise, could be written up now, it may be taken for granted that the name of Mr. Oscar Zollikoffer would appear in almost every line of the record. With undaunted faith in the future of the Company, he persisted in advocating the want that it would fill, and with unflagging zeal he forwarded its interests. The measure of success that attended the Company is, of course, a matter of record, and at the time that its proprietors finally assented to be parties to the compact that resulted in the formation of the present great Consolidated Gas Company, no other of the combining forces brought to the common interest a greater measure of solid worth. That the Metropolitan Company's success was largely due to the well directed, ably sustained efforts of Mr. Zollikoffer, cannot be truthfully gainsaid. And in that long period of his management no one can accurately say that his methods were not those of an honest opponent, whose cause was never advanced by resort to practices that would not admit of scrutiny in the bright sun of open daylight. Gruff he may have been, honest he always was; and with the weight of over four score of years resting on his frame he still retains his old friendships and attracts new ones.

When the affairs of the old Metropolitan Company were finally disposed of—matters that were extraneous to the details of its merging with the Consolidated—which winding up did not receive full official sanction until some weeks ago, the old Board of Directors, carefully refraining from giving an inkling of their intentions to their chief, quietly determined to prepare for him a token that would in some sense express to him that their old-time recognition of his ability and their friendship for him as well still survived mergers and all else. Something over a week ago we received intimation that our presence at No. 210 West Forty sixth street, this city, would be welcome to the signers, on the evening of Friday, December 2, and impelled by a sense of duty and of friendship, we reported at the place and time named. There we found several old timers gathered in the spacious parlors, and, to cut out the preliminary details, which were very much like those of other similar happenings, Mr. Zollikoffer, Sr., found himself confronted—there was a very suspicious looking disarrangement of the portiere hangings in the rooms—by his friend, Mr. Henry Meyer, of the old importing firm of H. & F. M. Meyer, who without delay began a very pleasantly put recital of what Mr. Zollikoffer's old-time associates thought of him and of his acts. Concluding his really affecting message, the portieres were withdrawn, and there rested unveiled a magnificent set of Tiffany bronzes, comprising an elegant clock and side pieces, also a very beautiful set design. The testimonial bore the following inscription:

OSCAR ZOLLIKOFFER,
from the Directors of the
METROPOLITAN GAS LIGHT COMPANY,
of the City of New York,
as a Token of their Appreciation of his
Management of its Affairs.

The senior Zollikoffer is not usually at a loss for words, but in the light that he then stood, one had to guess from the motion of his lips that which he said. It sounded and looked like "I thank you." The gentler sex were evidently in the plot, for ere the recipient had time to half recover his equanimity, all were seated at a collation that all enjoyed. Before the end of the repast the old Roman found both his wits and his voice, with the result that Mr. Meyer's presentation speech was royally replied to. A delightfully informal evening was then enjoyed by all present, and when the time to say good night came, none had aught in their recollection that was not laden with the kindliest friendship.

A "Process Man" Who Does not Know Much about That Which the Figures of his Gas Analyses Would Reveal to the Veriest Schoolboy.—Early this month the Manager-Engineer of a very large Gas Company in the East received the following letter from the manipulator of a patented process for gas making, the headquarters of the said manipulator being in this city, and we hasten to place the same before our readers, suppressing all names to the affair, of course. We can say, however, that the letter was absolutely sent and received, for we have it before us. We do not believe comment of ours would add to it in any respect; it is so plain that it would be a pity to detract by such comment from anything and everything it so plainly reveals:

New York City, Dec. 2, '92.

Mr. *. *. * * * * * *—Dear Sir: Yours of 24th ult. only received this morning in consequence of misdirection. Inclosed is chemical analysis of Prof. Love, who is an authority, as you well know, on gas that cannot be disputed. The candle power is guaranteed to be not below 20. I also send a blank form of contract which the * * * * is ready to execute, to determine the practical value of their (*sic*) system. The cost of erecting generators is stated in my letter of the 17th ult. I want a good party to go in with me and secure the rights for the N. E. States, which, with the exception of Connecticut (and possibly we could get that included), can be obtained upon the following terms, viz.: For $10,000, an option for 6 months to buy the rights for the sum of $75,000, and 30 per cent. of the stock of the Company purchasing the same. If at the end of the 6 months the purchase is not effected by the payment of the balance due ($65,000), the option becomes void and the first payment forfeited. The terms are very reasonable. Your plant at * * * * * * * * * * alone could save the cost of the rights for the whole of New England in one year. I am ready to take a one tenth interest in it. Please make an early appointment to investigate.——Yours truly, * * * On the reverse side of the sheet is given the following:

*Certificate of Analyses of * * * Gas, made by Prof. E. G. Love, Ph.D., Gas Examiner of New York City, July * * 1892.*

Hydrogen	1.43	per cent.
Marsh gas	12.13	"
Carbonic oxide	*none.*	
Heavy hydrocarbons	11.39	"
Nitrogen	59.96	"
Carbonic acid	7.29	"
Oxygen	7.80	"

And there you have it! Nothing is said about the sp. gr., but judging from the bulk of the three last noted components, it is by no means feathery. However, we said we would not comment upon the matter; and we won't.

Du Quoin, Ills., Wants Electric Light.—In our small "ads." for this issue appears an appeal from Mr. F. V. Nettleton, City Clerk, of Du Quoin, Ills., who asks for proposals for the cost of furnishing an electric light plant at that point, under certain stipulations that, from their oddity, are well worth reading. It is also worthy of remark that Du Quoin now supports a gas plant, constructed there not a great while ago.

The Oxy-Hydrogen Gas Company Wants Relief.—Mr. J. Edward Addicks and his associates, who, under the ruling of the Street and Sewer Department of Wilmington, Del., have been unable to lay pipes in that city for the distribution of gas, are tiring of the situation. They are about to apply to the said Department for a withdrawal of the injunction proceedings, which were taken in April, 1891; in the meantime, Mr. Betts and his associates in the Wilmington Coal Gas Light Company are amusedly watching the squirming of their would be Oxy-Hydrogen competitors.

[Translated from *Le Gaz*, for the American Gas Light Journal, by Mr. Herman Poole.]

New Model of Cast Iron Annular Condenser.

By G. Jouanne.

The annular condenser certainly forms one of the best apparatus which we employ in gas manufacture. The type created by Kirkham under the name of "ventilating condenser," and perfected by Wright, is much more used in England and Germany than in France, where this system of condenser is very little employed.

Yet it presents incontestable advantages and qualities which should urge its application. Everyone knows the principle; it consists in forming, by means of two concentric pipes, an annular space through which the gas circulates, which the walls of the exterior envelop, and those of the interior one are simultaneously exposed to the action of a current of air. In other terms, the gas circulates between two concentric walls, which are sufficiently near each other for its contact with the refrigerating surfaces, aided by a slow movement, in order to have the contact as complete as possible.

The annular condenser, consequently, suits the essential conditions of a good condenser much better than the ordinary kind.

Apparatus of this sort, employed before this, have been made of wrought iron, which, with regard to its conductivity, may be a good material, but which does not present all the advantages wished in point of cost of first installation, or in point of durability and maintenance.

To simplify the construction, and at the same time make the setting up more easy, repairs nothing, and durability nearly infinite, we have had the idea of inventing a new type of annular condenser, entirely composed of such pipes of cast iron and connections as may be found in the trade. The only exception is the single special piece which forms the top part of the vertical portion, arranged as shown in the cuts accompanying this description.

An examination of these figures readily shows the arrangement of our apparatus. Each constituent element of the condenser is formed of two concentric pipes, one of 10 inches, the other of 16 inches diameter. They are simple flanged pipes, each fitting in connections with joints at the same level, the lower portions of which terminate or carry two branches bolted together. These pipes may be 10 or 13 feet in height. We may also, by superposing two pipes, obtain vertical columns of 20 or 26 feet high.

The top part of the annular space thus formed by these concentric pipes is closed with a cover, also annular, fitted to the pipes. This

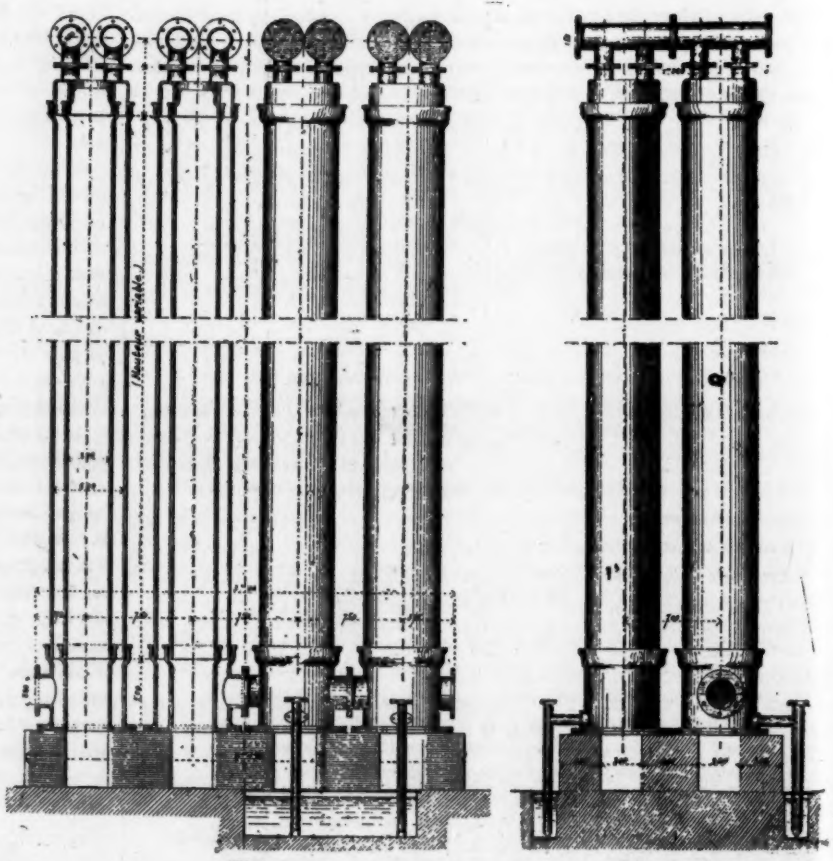


Fig. 1. Fig. 2.

Annular Condenser Constructed Entirely of Cast Iron.

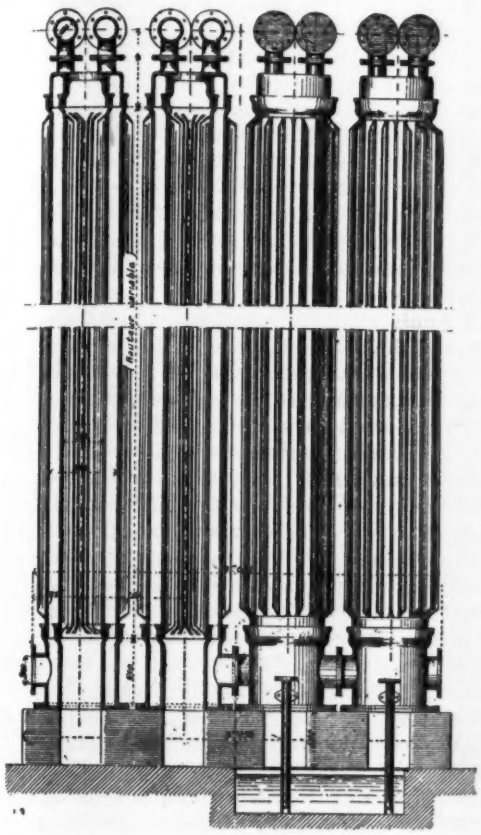


Fig. 3.

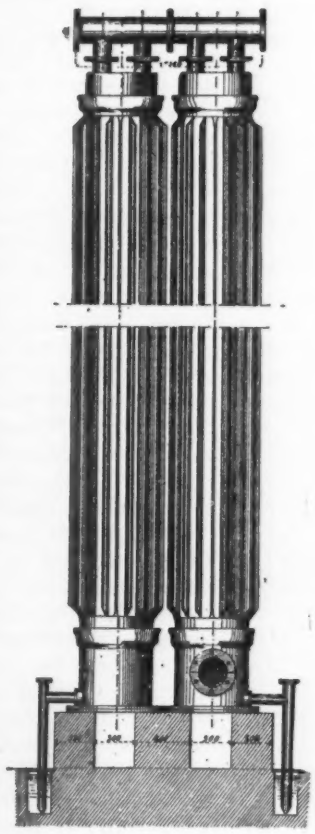


Fig. 4.

Annular Condenser of Cast Iron Pipes, with Wings.

cover has four branches, which allow the gas to pass in divided currents on the annular circumference, which serves better than to give a single orifice for the escape, and always placed on the same side of the column as in preceding types.

It is easy to conceive that, with the annular elements thus arranged, we possess facilities for making all the groupings we may wish, according to the development we need in the apparatus, with regard to the daily production of gas, and according to the space at our disposal.

We may, for example, form a condenser of 4, 6, 8, or 10 elements grouped on the same line. We may group them 8, 10, or 12 elements, arranged in two lines, as in Figs. 1 and 2. Each condenser may be composed, consequently, of any equal number of annular elements deemed advisable.

To make this apparatus useful for small gas works as well as large ones, we have till now made two sizes, of which the elements are as follows :

	Type No. 1.	Type No. 2.
Diameter of outside pipe.....	10 inches.	16 inches.
" " inside "	5 "	8 "
Height.....	12.5 feet.	16 feet.
Exterior surface.....	58.8 sq. feet.	102.2 sq. feet.
Interior "	18.8 "	47.6 "
Cooling "	77.6 "	149.8 "

As these figures show that a small number of annular elements suffices to obtain a great development of cooling walls, and consequently one of the principal characteristic advantages of our apparatus is to offer a large cooling surface, while requiring only a very small space for its installation.

Figures 3 and 4 represent the same type of annular condenser, but with the addition of wings cast on the exterior and interior surfaces exposed to the air current. These wings have naturally for their aim to increase the cooling action by offering a more developed surface to the contact of the air. The effect of the wings is too well known to make it necessary to insist on this point, and it will be sufficient to only look at Figs. 3 and 4 to render plain the arrangement we have been speaking of with the view of augmenting the efficiency of our apparatus.

The model represented in Figs. 1 and 2, composed of common forms of pipe of commerce, is recommended by its simplicity of construction, by the facility of erection, and by the guarantee of tightness which the lead joints offer, they being the ordinary ones used in pipe laying.

We will remark, also, that the combination of these elements yields more easily than the ordinary arrangements of pipes set on boxes or cylinders, to later enlargements of plant as the increase of daily production demands. It will be sufficient to add any equal number of new elements following the previous ones to increase at will the cooling surface of the condenser.

It is on account of the numerous advantages enumerated above that our new type of annular condensers is recommended to the attention of directors and constructors of gas works.

Mr. William Young's New Oil Gas Plant.

Our English correspondent, in his letter dated Nov. 10 (see JOURNAL, Nov. 28, p. 770) made mention of an oil gas process recently brought out in Great Britain by Mr. William Young, of Peebles, Scotland, and our English contemporary (*Journal of Gas Lighting, etc.,*) in a recent number printed a lengthy comment on or description of the process. That authority says :

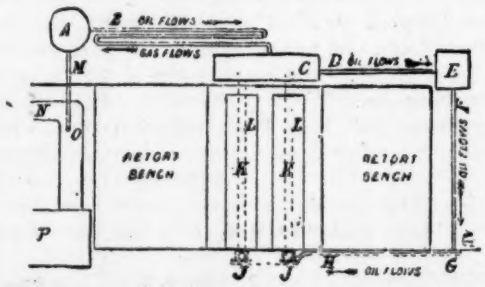
It may be remembered that in the *Journal* for Oct. 18 last our Edinburgh correspondent announced in his "Notes" that Mr. W. Young, of Peebles, had invented a process for the enrichment of coal gas with oil gas, which was likely to lead to very important results. As the announcement has created a great deal of interest, we are glad to be able to lay before our readers a description of the invention. Our correspondent stated that Mr. Young undertook the task of investigating the subject more in the interest of the oil than of the gas industry. As a matter of fact, his instigator was Mr. John Fyfe, the Managing Director of Young's Paraffine Light and Mineral Oil Company ; and the first step in the proceeding was taken some years ago. The idea was to discover some means whereby the oil trade of Scotland could be rescued from the eclipsed condition into which it had been thrown by the enormous importation of American and Russian oils. Mr. Young set to work with a will —his interest having been all along more in oil than in gas ; and it is needless to say that he started on his experiments with a knowledge of the subject which was so far in advance of that possessed by many, that he was able, at the first, to discard every one of the accepted processes of oil carbonization. Hitherto the process universally followed has been to carbonize the coal and oil in the same retort, and to subject the gases to the same treatment after leaving it. This Mr. Young has entirely set aside. He has been for years familiar with the process followed in the manufacture of gasoline, where the gas that is generated is purposely kept in the liquid which is sent out to be gasified. Borrowing a hint from this process, he vaporizes the oil, and, instead of retaining the illuminating gas which is part of the product, he releases it, and sends it on to the purifier—keeping back merely the portion of the oil which has not been converted into illuminating gas. It is there that the first point of his invention comes in. When oil is introduced into a retort, it is very quickly converted into vapor, only a small proportion of which, however—about one-fifth or one sixth—is illuminating gas. The rest consists simply of vapors, which, on the opportunity arising, will once again resolve themselves into oil. That which has been really gasified will remain so like any other gas ; but then the question arises : What will resolve the ungasified vapors? Mr. Young has been able to supply the answer ; and it is simply this : Oil itself. Working on these two radical principles, he has succeeded, where all others have failed, in carbonizing the whole of the oil. Where others, working with a high heat, found that they had trouble with the inlet or the ascension pipes choking, or, on the other hand, working with a low heat, that the gas was robbed, by condensation, of its illuminating properties and there was trouble from condensation, he had no difficulty whatever. In his hands the whole of the gaseous products of the oil are extracted, but not at once ; and those which, if passed on, would condense, are sent back to be again subjected to treatment in the retort. In Mr. Young's view, oil is a hydrocarbon, and contains nothing but gaseous products and carbon. There is practically no tar, nor any condensable or non-gasifying liquids in it. The mistake hitherto made has been in attempting to gasify oil at one operation. When a quantity is placed in a retort, it is found to vaporize very quickly and pass on ; but time has not been given, and it cannot be taken, in the retort, for the complete gasification of the whole of it. Consequently, the portion which has been merely vaporized, but not gasified, will sooner or later return to a liquid state. By Mr. Young's process, the earliest opportunity is taken for converting these vapors again into oil, and sending it back to the retorts for further treatment. Working in this way, he obtains practically only two pro-

ducts—a permanent gas of nearly 100 candle power, and a very rich coke. The only other product is a very small percentage of sulphureted hydrogen, which is eliminated by the purifiers.

In describing the process, it may be said that it is simplicity itself. No materials are required except the oil, with the addition of the heat of the oven; and no mechanical appliances are used, not even an exhauster. The starting point of the process, for purposes of description, is the scrubber. This is an apparatus entirely similar to that which Mr. Young has introduced for the treatment of coal gas. It is of the familiar up right cylindrical shape, of cast iron, and is built in sections. Each section has a diaphragm, or shelf, in which are a number of papilliform openings, pointing upwards. Each opening is covered by a tin cap, from the center of which a wire passes downwards to keep it in position. On each diaphragm there is, in the oil process, a supply of oil, regulated so that the tin caps dip into it to the extent of one-eighth of their depth. From the scrubber there proceeds, at considerable length, a condensing pipe, in serpentine form, placed horizontally, but with a dip falling away from the scrubber. On the top of the scrubber is the oil supply reservoir, with graduated scale and regulated outflow. By an ingenious arrangement, the outflow is so managed that, according to the prevailing temperature, it can be directed into either of the divisions of the scrubber. The scrubber in use at Peebles contains four diaphragms. In time of severe frost, the fresh supply of oil can be sent into the scrubber above the top diaphragm, and so be caused to pass down through the other three. In milder weather, the fresh oil can be introduced at will into the space above the third, the second, or the first diaphragm. Last week, when our representative had an opportunity of seeing the apparatus at work, the temperature was such that the oil was not passed into the scrubber at all, but was sent direct from the reservoir on the top into the end of the condenser next the scrubber; due provision being made for the renovation of the oil in the scrubber.

As stated above, the condenser has a dip away from the scrubber, and when once the oil is in the condenser it travels, against the flow of the gas, into the hydraulic main. From the latter (provision being made for sealing), the oil is carried forward to a reservior, where it is stored till it is required to be sent into the retorts. From this reservoir, again, a pipe leads into the retort house, where there is placed a regulating apparatus, by which the man in charge is enabled to control the whole of the process. The retorts are used for oil only. With ordinary oil they run 24 hours without being opened; but should the oil deposit carbon in such quantities as to necessitate it, they would, of course, be opened more frequently. The oil is led from the regulating apparatus, through a properly sealed pipe, into the ascension pipe, about half way up the face of the retort. Entering there, and flowing down the ascension pipe, it helps to keep the passage open. In addition, the retorts are maintained at a low temperature—a dull red heat; and the two influences combined prevent any tendency to choke. As a matter of fact, when the retort lid is taken off at the end of 24 hours, all that is found is a stalactite-like formation of carbon at the mouth of the ascension pipe, with an opening, however, in the center of it, which is sufficient for the entrance of the oil and the exit of the gases. Such a thing as a choked pipe has never been known with this process. The retorts dip to the back, for reasons which will be explained later on. The oil, having been introduced into them, is, as stated above, vaporized; and the whole of the vapors pass up the ascension pipe and into the hydraulic main. This is sealed with oil, derived from the condensers; and the condensable vapors are there arrested to some extent. Passing onwards, the gases enter the condenser, down which, as already explained, the fresh oil flows; and there a further portion of the condensable vapors are resolved again into oil, and flow back into the hydraulic. Should the gases pass the condenser, they have still to encounter the scrubber, through the four diaphragms of which they have to bubble; and the result found in practice is that, by the time the uppermost diaphragm is passed, all that remains of the vapors which left the retort is a permanent gas, possessing exactly the same properties, except as regards its specific gravity, as that derived from coal. Having passed through the scrubber, this gas is led into the main which comes from the coal gas condensers, and, mingling with it, flows into the purifiers. So far as the oil gas process is concerned, the operation there comes to an end. The difference in the specific gravities of the two gases is found to be no bar to their combination. For all practical purposes, when the two gases enter the purifiers they are one; and after they leave the purifiers no difficulty is experienced with respect to their intermingling. Neither is there any deposit in the pipes—that being out of the question, seeing that all that leaves the scrubber is simply illuminating gas and a little sulphureted hydrogen. To return, however, to the process. It has to be noted that the vapors, on leaving the retorts, consist of only from one fifth to one-sixth of permanent gas, and that the remainder are again converted into oil and sent back to the retorts. Consequently the latter, dealing with this five sixths, or thereabouts, of "old oil," cannot take a full quantity of fresh oil; and the supply of fresh oil from the reservoir on the top of the scrubber must be only one-fifth or one sixth that which is passing through the retorts. This is one of the most ingenious parts of the process—the maintenance of two different degrees of flow; but the apparatus is so arranged that, in practice, there is no clashing of the two "interests." If the inflow of fresh oil is too slow, all that happens is that the store in the reservoir serving the retorts falls; and an indicator gives warning in time to enable the supply to be augmented. In the same way, if the quantity is more than the apparatus can deal with, the only result is that the oil in the retort-supplying reservoir rises, and the attendant has simply to restrict the supply of fresh oil. The process is so flexible that, if it is required to produce more oil gas, the attendant has simply to fire up, and augment the supply of fresh oil; or if less should be needed, he merely has either to cool down, or throw the retorts out of use for an hour or two.

In making the oil gas, the process is continuous, and does not require any attention, except in regard to the heat and the inflow of oil; and the latter only requires looking after once in every two or three hours. The retorts at Peebles—both those employed in the manufacture of coal gas and those which have been adapted to oil gas making—are fired on a semi-regenerative system which Mr. Young has devised. The method of firing has, however, nothing to do with the efficiency of the oil process. For the working of this, a setting of three retorts has been withdrawn from the work of producing coal gas, and the oven has been fitted up with two retorts suitable for carbonizing oil. The method of working consists in simply closing the retorts and turning on the oil; then, at the end of (say) 23 hours, the oil supply is cut off and the retorts are allowed to stand for an hour, in order that the last run oil may have time to vaporize and the coke to solidify. When a retort is opened, all that is found is a few carbon stalactites at the mouth of the ascension pipe and a thin layer of coke in the bottom of the retort. This is easily raked out, and the bottom is then scurfed—an operation which is easily performed. The retort is now ready for another turn. While Mr. Young is superintending the process, it should be stated that Mr. A. Bell, Jr., the Manager of the works, has charge of the whole of the operations, and that he is keeping record of the quantity of oil consumed in every charge, and of the resultant gas and coke.



A, scrubber, with oil reservoir on top (regulating apparatus not shown); *B*, condensers, with dip towards *C*; *C*, hydraulic main; *D*, outflow oil pipe from hydraulic main, carrying five or six times the quantity of oil drawn from the reservoir at *A*; *E*, oil reservoir from which the retorts are supplied; *F* and *H*, supply pipe to retorts, doubled after passing *G*; *G*, regulating apparatus for flow of oil into the retorts; *J*, mouthpieces and ascension pipes; *K*, ascension pipes running along the top of retort bench to hydraulic main; *L*, retorts, with dip to back; *M*, pipe conveying oil gas from scrubbers to purifiers; *N*, pipe conveying coal gas from condenser; *O*, point where oil and coal gas intermingle; *P*, purifiers.

We will now give a more technical description of the process, the plant for carrying it out being shown in the above diagram, which is drawn from recollection, and is not according to scale. It is simply intended to give a better idea of the working of the process than the letterpress probably conveys. If it had been intended to furnish a correct representation of the plant, the purifier would have been shown as far away from the retort bench as nearly half the width of a column of the *Journal*. The consideration of space is the only reason for *N*, *O* and *P* being brought so close to the retort bench as represented. The plant may be said to consist in decomposing the oil by repeated alternate exposures to a dull red heat in the cast iron retorts, and condensing and washing with oil; the result being the entire splitting up of the oil into gaseous products and solid carbon. The plant employed is very similar to that used to carbonize coal for the production of gas—consisting of retorts, hydraulic mains, condensers and scrubber-washer. The retorts are of cast iron, 2 feet in diameter and 9 feet long, and circular in form. Two are placed in a setting, with a considerable fall to the back. Each retort is provided with a standpipe 5 inches in diameter. The condensers and scrubber-washer are arranged to allow of the liquid products

falling back into the hydraulic main, from which they are drawn off into a covered cistern provided with a float and indicator. From this cistern they are allowed to flow in regulated streams into the stand-pipes of the retorts. The supply of oil to be decomposed is obtained from a cistern placed on the top of the scrubber-washer. By suitable arrangement of pipes and valves, the oil can be admitted to flow down through the whole or any number ot the compartments of the scrubber-washer, or it may pass direct to the hydraulic main, according to the amount of washing and decomposing to which it is desired to subject the gaseous products. The oil is admitted to the plant by a graduated valve, flows backwards through the apparatus, and collects in the covered cistern at the end of the hydraulic main. When there is a sufficient supply of oil in the cistern, it is admitted, by means of suitable valves and syphon pipes, into the retorts, as already stated, through the stand pipes. When passed into the retorts, which are heated to a dull red heat, the oil, flowing down the inclined plane on which they are set, is volatilized—the more volatile constituents first, and the less volatile only after they have travelled well down to the far end of the retort. The different oils are thus subjected to varying amounts and periods of heat, which lead to their partial decomposition in a gradual manner according to their volatility. The partially decomposed oil vapors pass away up the stand-pipes, where they are to a certain degree washed and condensed by the inflowing oil. The washing of the decomposed products is continued in the hydraulic main, condensers and washer, by the oil flowing back to again undergo decomposition. The gaseous products of decomposition are thus rendered free from vapors which might be condensed; and they are thereafter passed through a meter, and commingle with the coal gas at the inlet to the purifiers. The quantity of oil fed from the supply cistern into the arrangement is regulated so as to be equivalent to that portion which undergoes decomposition in the retorts; and the exact quantity is indicated by the float in the cistern which receives the oil and condensed products from the hydraulic main—the float rising when the amount of oil supplied is in excess of that which is decomposed, and falling when it is less. The oil and the condensed partially decomposed products washed back with the oil through the hydraulic main to the feed cistern are regulated so as to flow into the stand pipes of the retorts in quantity a considerable number of times greater than that of those decomposed. The higher the external temperature of the retort, the more rapidly are the oils and condensed products circulated through them, in order to keep the internal temperature within the range suitable to crack up the oil, and so avoid producing an excessive deposit of solid carbon.

The result of thus decomposing the oil is that it is completely cracked up into gaseous compounds and solid carbon, the latter being all washed back into the retort, where it forms a very pure, hard coke of great value. The coke does not at all adhere to the retort, but is easily raked out. There is no deposit whatever of carbonaceous matter on the top of the retort, and the stand-pipes are left absolutely clean. The relative proportions of the coke and gas are dependent upon the character of the oil employed, and the temperature and rate at which it is circulated through the retorts in the process of decomposition. Any description of paraffine or petroleum oil, however crude, can be worked by this process; but what has been principally used at Peebles, and now wholly employed, is what is known as "blue oil," which is the portion of crude oil containing paraffine scale in solution, but which has been partially refined, and had its valuable scale removed. The oil is of a dark blue opalescence, and of specific gravity ranging from .880 to .890. It can be very cheaply supplied in large quantities by the Scotch oil companies. From this class of oil, 21,000 or 22,000 cubic feet of gaseous products, and between 5 and 6 cwt. of pure coke, are obtained per ton. By decomposing the oil at higher temperatures, a much larger volume of gas is produced; but the quantity of solid coke left in the retort is increased very considerably, and the gross sperm value of the gaseous products is much reduced. Indeed, the object of the process, as worked at Peebles, is to produce an enriching agent as permanent as possible in character, irrespective of volume. The specific gravity of the gaseous products is very high—nearly that of air. A gallon of oil yields from 6¼ pounds to 6½ pounds of gaseous matter, which has a greater enriching value than a gallon of gasoline, and yields more light when diffused through coal gas than a gallon of paraffine or petroleum oil burned in the best form of lamp. Since the process of enriching coal gas with oil gas was commenced at Peebles, the coal used has cost 11s. 4d. per ton delivered at the works, and it yields 9,500 cubic feet of 18 candle gas per ton. It requires 1,900 cubic feet of oil gas added to the 9,500 cubic feet of coal gas to bring up the illuminating power of the mixture to 30 candles. The present cost of the oil, delivered into the works, is 40s. per ton; and, as already stated, it produces from 21,000 to 22,000 cubic feet of gas of an enriching value equivalent to the product of at least 4 tons of first-class cannel. The present cost for materials to produce 30-candle gas, calculated from the above data, is 15.66d. per 1,000 cubic feet. It is probable that, if the process should be generally adopted, as is likely, the price of oil will rise, with the increased demand, to perhaps 60s. or 65s. per ton. At that figure new life would be infused into the Scotch oil industry. American and Russian oils might prevent the price from going up any farther; but, taking oil at 65s. per ton, the cost of producing, by this process, gas of 30 candle power would only be 18.01d. per 1,000 cubic feet. The gas and oil industries would thus both be benefited.

Oil Versus Air as an Insulating Medium.

[A paper read by Mr. J. Bowstead Williams, M. D., before a meeting of the American Institute of Electrical Engineers.]

All who have attempted to enlarge in the smallest degree the bounds of our knowledge, recognize the importance of the faithful collection of facts which, though seeming separately insignificant, may yet when brought together resolve themselves into distinct and important scientific truth. By combining the results of investigations carried on from different standpoints, we obtain a view of the subject more complete than any single mind, however masterly, could give us. Hence every item of information has its importance, as it may prove to some other investigator the exact clue needed to solve some long pondered problem. Acting upon this principle, the writer now offers an account of some experiments made by himself to determine the comparative insulation resistance of oils and air; and it has appeared to him that the results obtained from these experiments are especially important from the fact that all of the apparatus used was absolutely insulated, and that the only leakage that could take place was through or across the various substances experimented upon.

The relative powers of oils and air to resist disruptive discharges and also to insulate alternating currents, will not be considered at this time, as the writer proposes to reserve those subjects for a future paper.

The instruments used in the experiments from which the results about to be set forth in this paper were obtained, were an electrometer, a discharge key, a six inch spark coil and a Grenet cell to operate it, and apparatus for holding the oils and other substances while they were being tested.

The electrometer was a special form of quadrant electrometer, designed and made by the writer in San Francisco, in 1886, for the purpose of testing insulating material generally, and particularly for determining the comparative insulation resistance of very short pieces of insulated electric conductors. Its quadrants and needle system are similar to those of Lord Kelvin's electrometer, but the mounting of the quadrants and the needle suspension are different. No glass is used for insulating the various parts, this insulation being effected entirely by means of the best quality of hard rubber which is well paraffined. The suspension is of the bifilar type, is about six inches in length and is provided with adjustments. The replenisher and gauge are contained in a separate vessel, and when they are electrically connected with the electrometer proper the combination can be used in the same manner and for the same purposes as the "White pattern" quadrant electrometer. The insulation of this instrument is so perfect that its quadrants, when charged to potentials of about 6,000 volts, will retain their charge for several hours without any perceptible leakage.

Before the electrometer is used for comparative testing, it is so adjusted that the quadrants, when fully charged, will be charged to any desired potential of from 1 to 6,000 volts.

The discharge key resembles those in common use, the only difference being in the trigger, which is so constructed as to insulate as highly as any of the pillars of the key.

This instrument was used when time measurements were taken.

With this apparatus, using the same potential as that used in these experiments, the "dielectric after-working" of Boltzman can be demonstrated, if a few inches of highly insulated wire are tested. The variation of the capacity of a condenser having a small bare wire for its inner coating can also be shown.

The apparatus in which the oils were first tested consisted of a glass cup to contain the oils and two circular brass disks, parallel to each other, which were immersed in the oil and between which layers of oil could be formed.

These disks were each 2½ inches in diameter, one of the disks, the lower, being fixed and the other, the upper, movable. The movable disk was soldered to the end of an adjustable screw passing perpendicular through the center of the hard rubber cover of the cup, which was 3

inches in diameter. The fixed disk was supported at the middle of a U-shaped device formed of hard rubber tubes, both of the arms of which were cemented to the cover of the cup. One of these arms passed through the cover and extended about 6 inches above it, and contained the wire which was soldered to the fixed disk. The disks were absolutely insulated from each other and from the earth, and were separated $\frac{1}{8}$ of an inch by each revolution of the adjustable screw. The apparatus in which the second tests of the oils were made will be described later.

The method of testing the oils was briefly as follows: The needle of the electrometer, the induction plate, and one pair of quadrants were electrically joined to the frame of the instrument and to earth, and the second pair of quadrants joined to the upper disk.

The lower disk was connected with the binding screw of the upper contact of the discharge key, the lever of the key being depressed and held against the lower contact of the key by the trigger. The lever of the key was joined to earth. Oil was then poured into the cup, sufficient to cover the upper disk when this disk was separated from the lower disk by one-half inch, this being about the effective range of the screw.

The quadrants, and, of course, the upper disk were then charged by sparks from the coil, to a potential of about 2,300 volts, the illuminating apparatus and scale having previously been adjusted so that when the quadrants were fully charged the image of the cross wire would settle at the upper end of the scale, at 300, say.

As the quadrants and disks were absolutely insulated at the potential used, there could be no leakage of the charge as long as the lower disk remained insulated from the earth; but as soon as this disk was connected to earth, either through the medium of the discharge key or by having its electrode touched with a wire fastened to the gas pipe, leakage would take place through the layer of oil, whatever its thickness might be between the disks; and the rate at which this leakage took place was indicated by the rate at which the image of the cross wire passed down the scale, *i. e.*, by the rate at which the electrometer was discharged.

Before entering into a description of the experiments I wish to refer to a phenomenon which occurs when all good insulating material is tested by means of charges of high potential, if the material form the dielectric of a condenser.

Take any highly insulated wire and form, say, 4 inches of it into a condenser by closely wrapping the dielectric with tinfoil, and then carefully paraffine the ends to prevent surface leakage. The condenser thus formed is absolutely insulated from earth, and connected with the electrometer and discharge key in the same way as the condenser formed by the two disks and the layer of oil between them, *i. e.*, by connecting the wire with the quadrants, and the tinfoil with the upper contact of the key. The quadrants are then charged to potentials of 2,000 volts or more. This causes the needle of the electrometer, and with it the image of the cross wire, to be violently deflected to the right or left, depending upon which pair of quadrants is used. The needle then vibrates, but each succeeding vibration becomes quicker and shorter, until the image finally settles at 300, say.

Now, if the trigger of the key be made to release the lever, connection is made between the tinfoil and earth. A sudden "drop" of the image then occurs, which is due to the rapid absorption of a portion of the charge by the dielectric. The needle again vibrates, but the image soon settles at 250, say, if the wire be very highly insulated, and will remain at 250, thus showing that there is practically no leakage. But if the wire be a little less highly insulated, the drop still occurs, but the image simply "hesitates," as it were, at 250, say, and then passes slowly down the scale in proportion to the amount of leakage which is taking place through the dielectric. If the ground circuit be now broken by depressing the lever of the key, the quadrants again charged to the same potential as before, and the ground circuit established, the drop is then very slight, oftentimes *nil*, and the falling of the image along the scale is now due to the leakage through the dielectric and not to absorption by it.

No absorption of the charge by the dielectric can be detected as long as the outer coating of the condenser is insulated. If the image should move, there is a leakage in some portion of the testing apparatus, which must be remedied if the tests are to have any value. This drop is observed only when the best kinds of insulating material are tested by the method just described. It cannot be detected when the poorer qualities of insulating material are subjected to the same tests on account of the rapid leakage through them.

The potential of the charge was determined in the following manner: The length of spark produced by suddenly discharging the quadrants in air was approximately determined by bringing a pointed wire, held in the hand, close up to the electrode of the charged quadrants. Two bright tin disks, each $1\frac{1}{4}$ inches in diameter, were then rigidly cemented upon the ends of two stout hard-rubber tubes, which were well paraffined. These tubes were fastened together at the other ends in such a manner that by inserting a wedge between them the disks could be separated or made to approach each other and still remain substantially parallel at the striking distance of the spark. One of the disks was joined to the quadrants and the other to the discharge key. The quadrants were then fully charged and the key closed. If a spark passed between the disks, they were separated a little further apart and the test repeated. If a spark did not pass, the disks were brought a little closer together and the test again repeated. After several trials the disks were separated at a distance corresponding to the exact length of the spark.

Slips of thin writing paper were then inserted between the disks until they exactly filled the space between them and the thickness of the layer formed by the paper measured with a Brown and Sharp's micrometer gauge.

A suitable spark electrometer provided with parallel plates would have given the spark length by a direct reading, but the writer did not have the time either to make or procure one.

The length of spark was found to be .03 of an inch. From tests made with a Thomson static voltmeter, this length would correspond to a potential of about 2,300 volts. (A spark .026″ long = 2,000 v.)

But whatever the potential of the charge may have been—whether it was 2, 3 or 5,000 volts—the same potential was used in all of the experiments described in this paper.

The oils tested were rosin, paraffine, linseed, cottonseed and castor. The rosin oil was what is known as London oil. The paraffine oil had a specific gravity of 24° B. All of the samples were procured from wholesale dealers, and were declared to be of the best quality.

The first set of experiments include tests of paraffine and rosin oils, air, and a specimen of a well known insulated wire. This last test was made to show what took place when the dielectric of insulated wires was tested by means of charges of high potential, and also to make a rough comparison between specific resistance of this dielectric and that of the oils about to be tested.

The temperature during the tests was 82° F., and the humidity, as indicated by a Lambrecht's polymeter, 80.

It was first ascertained, by testing, that the quadrants used and the disks were absolutely insulated. Each separate experiment is designated by a number.

1. Paraffine oil was then poured into the cup and the disks separated one-ninth of an inch. The discharge key was not used in these tests in order to save time, a wire fastened to the gas pipe being used to ground the lower disk. The connections were properly made and the quadrants fully charged. As soon as the image of the cross wire had become stationary, the electrode of the lower disk was touched with the ground wire. The image immediately flew down the scale, apparently as fast as if the upper disk had been touched with the ground wire. That this sudden flight of the image was not due to the "drop"—*i. e.*, to absorption of the charge or the sudden rush of the electricity into the oil and not through it—was proven by repeatedly charging the quadrates and then discharging them through the oil. In fact, the amount of leakage was so great that while the lower disk was kept grounded, the quadrants could not be charged.

If leakage through a very thin layer of any good dielectric be not too excessive, the quadrants can always be recharged, wholly or in part, even while the leakage is going on; but, in this case, the leakage was too great even when sparks were rapidly poured into the quadrants.

2. The disks were next separated $\frac{1}{4}$ of an inch, but no better results were obtained than at first.

It is evident that there must have been less leakage through a layer $\frac{1}{4}$ of an inch thick than through one one-ninth of an inch thick. But, in both cases, the movements of the image were too rapid to be timed.

3. The cup was then emptied of the oil and a few drops introduced between the disks, and still no different results were obtained.

4. The oil was then heated to about 280° F., to expel any moisture that might be present. But this made no difference in the tests; there was still great leakage, even after the oil had cooled.

5. Rosin oil was then subjected to the same tests as the paraffine oil, but no better results were obtained from it than from the paraffine oil.

6. All oil was removed from the disks and a layer of air $\frac{1}{16}$ of an inch thick tested. The drop was about five divisions, but after that the image remained stationary, thus showing that the insulation resistance of the air, at the potential used, was absolute.

7. A piece of the insulated wire before referred to, about 5 inches long, was connected with the quadrants and the quadrants charged. The edge of a pocket knife blade was then held transversely upon the dielectric,

when the image passed rapidly down the scale. This experiment was repeated and the same result obtained. The ends were then paraffined and the specimen again tested. Result almost the same as before paraffining, thus showing that that there had been some surface leakage at first.

Many of the insulated wires now in use yield the same results when tested exactly as this present sample was tested. But there are also many which give excellent results when thus tested, and there are a few in which there is very little leakage even when several feet are formed into a condenser and tested at this same potential.

It is important to remark that tests of different sections of the same wire, having a vulcanized dielectric, may not always give the same results. For example, a 3 inch piece of a certain wire may have a very high indicated resistance, while the next 3 inches may have an indicated resistance much lower than that of the first. Where this is the case, it will almost always be found that the dielectric of the second sample contains some flaw, or else has particles of wood, metal, etc., embedded in the mass.

By using this method of testing, the superiority of one insulated wire over another, whenever samples a few inches long can be obtained, can easily be demonstrated. It will readily be seen that this fact may become of great importance in legal or other cases in which the comparative insulation resistance of wires is involved. Decisive results can be obtained in many cases from lengths of two or three inches only.

The second set of experiments included tests of all five oils, paraffine, wax, ordinary air, and steam. The temperature was 80° F., and the humidity 75.

In the second set, the layers of oil were formed between an upper disk $\frac{9}{16}$ of an inch in diameter, and a lower disk 1¼ inches in diameter. This lower disk was the flat bottom of a tin box. Its sides were covered with a thick layer of paraffine wax, so that no leakage could take place except through the layers of oil. The disks were mounted the same as the larger disks, and were absolutely insulated from each other and from earth.

1. Paraffine oil was first tested in a layer ¼ of an inch thick, but the falling of the image was too rapid to be accurately noted. A layer ½ of an inch thick was then tested and gave a fall of 207 divisions in one minute.

2. Rosin oil tested in a layer ¼ of an inch thick gave a little better result than the paraffine oil ; but when a layer ½ inch thick was tested, the fall was 177 divisions in one minute.

In these two tests of the two oils all effects due to the drop were eliminated by repeated chargings, so that the fall due to leakage alone was noted.

3. Linseed, cotton seed and castor oils were each tested in ½ inch layers, but as the fall of potential was so much greater than that of the other two oils no further tests were made of them.

Of the three, castor oil had the lowest specific resistance, and there was but little difference between the linseed and cottonseed oils, what little difference there was being in favor of linseed oil.

4. A layer of paraffine $\frac{1}{16}$ of an inch thick and free from air bubbles was next formed between two tin disks, each 1⅝ inches in diameter, and tested like the layers of oils. When the ground circuit was closed the drop was just five divisions. The quadrants were again fully charged and the falling of the image noted. This fall was one division in two minutes, or 30 divisions in one hour.

5. A brass tube 10 inches long and $\frac{5}{16}$ of an inch in diameter was next used for a receptacle for oil. In the center of this tube was a straight copper wire $\frac{1}{16}$ of an inch in diameter, the wire being kept concentric with the tube by means of two hard-rubber plugs with holes through their centers. The tube contained rosin oil. The wire was connected with the quadrants and the tube absolutely insulated from the earth and neighboring objects.

The quadrants were then charged and the tube grounded. The image passed down the scale too rapidly to have its rate of falling timed. The hard-rubber plugs were carefully paraffined so that all of the leakage took place inside the tube.

A torrent of sparks was poured into the electrometer, but it could not be charged on account of the rapid leakage through the oil.

6. Three plates of glass, each 3 by 4 inches and ⅛ of an inch thick, were carefully cleaned and then dried over a lamp. Before they had cooled one was covered with a film of resin oil, one with a film of paraffine oil, each film having an area of about 2 square inches, and the third had a film of paraffine wax about 1 inch square formed on it. A No. 20 copper wire was fastened to the quadrant electrode, and its free end placed in contact with the center of the film on the glass. The glass was insulated and the quadrants charged. The image remained stationary as long as the glass was insulated, but as soon as any conducting body, the hand, for instance, came in contact with any portion of the glass plate, leakage over the film of the material on the glass occurred. In each case there was a slight drop, but the quadrants were immediately recharged. The rate of falling of the image with the glass plates covered with the oils was practically the same, the fall being about 5 divisions to the second ; but with the paraffine wax the image remained stationary.

Repeated charging failed to alter the rates of falling of the image.

7. The last tests were made with air and steam, and in both tests the layers were formed with the device used to ascertain the potential of the fully charged quadrants. In the first of these tests, the disks were separated a trifle more than 0.3 of an inch.

The drop in this test was just two divisions, but after that the image did not move in 20 minutes. The writer has made this same kind of test in former years, and has allowed the instruments to stand for hours, and yet there would be no leakage through the layer of air.

The last test was made with a layer of steam of the same thickness as the layer of air in the test just described.

The quadrants were fully charged and the ground circuit closed. Steam was then generated in a test tube and the mouth of the tube held directly beneath the disks. This enveloped the disks in steam and also formed a layer of steam between them. As soon as the layer of steam was formed, leakage took place through it, and the leakage increased as moisture was deposited upon the disks (thereby reducing the distance between them) until a bridge of water was formed, when, of course, the quadrants were immediately discharged. From many tests the writer found that, as nearly as he could determine, the rate of fall, when the layer was composed entirely of steam, was about 20 divisions in 1 second.

He would state, however, that he was entirely alone during these experiments upon steam, and as his attention was necessarily divided between several parts of the apparatus, each of which required continual watching, he cannot vouch for the accuracy of these figures ; but he has every reason to believe that they are approximately correct.

Several times during the tests, oil was accidentally smeared upon the surface of the paraffined hard rubber, and in every case the rubber would have to be recleaned and reparaffined before its surface insulation was restored. From a careful consideration of the foregoing tests, the results thereof appear to the writer to prove, when continuous high tension currents alone are concerned :

1. That air, even when it has a humidity of 80 per cent., is infinitely superior to oil for insulating conductors carrying such currents.

2. That pure paraffine is far superior to oil, both for insulating conductors and for preventing the escape of the current across the surface of glass.

3. That air having a humidity of 80 per cent. is superior to paraffine as an insulating medium.

4. That oil will not prevent leakage of the current across the surfaces of glass.

5. That whenever oil covers the surface of hard rubber, even when the latter is paraffined, it destroys the high surface insulation of the paraffined hard rubber, that is, the low surface insulation of the oil has been substituted for the higher surface insulation of the hard rubber, when used bare and clean, or when covered with paraffine.

The writer would state that the results of the present tests, which were made in New York City, correspond substantially with the results obtained by himself and brother, and R. W. Welty, while they were making the investigation of insulating material and its applications, which is now being described in the serial before referred to.

A few words relative to the use of the oils in practice may not be amiss here. To use oil for insulating conductors there must be an enclosing vessel of iron, or its equivalent, for the oil and conductors. If long tubes are employed for the purpose, two things are indispensable—plugs in the ends of the tubes and means for keeping the wire or cable concentric with the tube, and the individual wires of a cable separated from each other. For the latter purpose, fibrous material is probably the most convenient means. Jute, when pure and dry, is an excellent fiber, both for the oils when used alone and when thickened with rosins, etc., for by reason of the peculiar nature of the fiber, a larger amount of insulating material can be placed within a given space than if a closely lying vegetable fiber is used ; and there will also be fewer points of contact of fiber between the wires and the inside of the tubes. Experiments made by the writer show that there is but little difference in the specific resistance of different kinds of vegetable fiber when the fiber is clean and absolutely dry. The resistance of such fiber is high as long as it remains in this condition. But it is almost impossible to keep it so. It may be a matter of surprise to many to learn that cotton which has been

dried, and which therefore possesses good insulating properties, loses these properties in less than ten minutes if exposed to a damp atmosphere.

Whatever means are used for the purpose last above stated, they should have a high specific resistance and allow the use of oil as much as possible.

The plugs must be formed of insulating material which is not injuriously affected by the oils. The best hard rubber, or some special vulcanized rubber or gutta percha compound appears to be the best for this purpose. Paraffined wood is very apt to be of little use in a short time, for no matter what kind of soft, porous material is paraffined by allowing it to absorb the melted wax, the wax rarely hardens in a solid form, but usually contains numerous small spaces and these spaces absorb moisture by capillary attraction. It is for this very reason that a di electric which is formed of fiber saturated with paraffine soon loses its high insulation when exposed to the air. The microscope will demonstrate the presence of these minute air spaces.

All oil should be carefully heated, sufficient to expel all moisture and air, before it is used. If paraffine oil is used, it is better to subject the oil to a comparatively low temperature and exhaust the air by means of a vacuum than to heat the oil to a high temperature. After the mois ture has been removed, the oil must be kept excluded from the air or it will again absorb moistnre.

If oil is used as a covering for insulators made of inferior glass or porcelain, to be of value it must contain no moisture or dirt; and if used in damp and dusty localities, means must be provided for the self-renewal of the oil, so that fresh surfaces of oil may constantly be exposed. But if insulators had surfaces formed of glass which contained a large proportion of pure silica, better insulation would be effected, if these surfaces were not covered with oil. The writer once found a molded glass vessel, having about the same dimensions and area as the "pony" insulators, which had a surface insulation vastly superior to that of the "pony" insulators. If insulators were made wholly or in part of such material a covering of oil would be worse than useless, for experiments have shown that when glass or other material does prevent surface leakage, covering it with oil at once ruins the high surface insulation.

Experiments made upon the expansion of paraffine and rosin oils show that when paraffine oil is heated to 280° F., a column of 3½ inches long and ¼ of an inch in diameter expands ¼ of an inch; and that if a column of rosin oil of the same dimensions is heated to the same temperature, it expands ¼ of an inch. These facts should be taken into consideration when using these oils in pipes, for if the pipes are full and the oil gets heated, it will expand and probably either expel the plugs or exude at the ends. If it exudes, dust and moisture will collect upon the film of oil and cause surface leakage. This leakage at the ends of pipes containing telephone or telegraph wires might not be detrimental to the working of the lines, but if the pipes contained wires carrying high tension currents, serious trouble might arise.

The efficiency of oil to fill holes in dielectrics depends greatly upon circumstances. If the holes or gaps should be formed in dielectrics of wires conveying weak currents, the oil, if not too sluggish, would have plenty of time to move into and fill such spaces; but if in the dielectric of wires conveying strong currents, the oil must move very quickly or a disastrous burn-out is the result. And not only this, but the oil, becoming hot, expands, and the pipes, if of lead, are apt to be strained or broken by the increased pressure from within outward. If the burn-out occurs near the ends of the pipes, the plugs may be expelled. If the filling of spaces were the only thing required of the oils, the lighter ones would accomplish this purpose better than the denser ones. But the heavier oils—*e. g.*, heavy and light paraffine oils—are much better for insulating purposes than the lighter.

In conclusion, the writer would state that he feels warranted in believing, unless the contrary can be demonstrated, that dry air, if employed to form a portion of the dielectrics of insulated conductors, and if the conditions upon which its highest efficiency depends are fulfilled, is an insulating material superior to oil and even paraffine. In making this statement, he takes it for granted that his method of testing—a method which he does not remember ever to have seen published before his use thereof over five years ago—yields results, the accuracy of which can be relied upon. This belief has been established after several years of experimental work upon insulating materials and the manufacture of different kinds of insulated conductors. Certainly air is cheaper than any other insulating material, and it is not destroyed or injured by intense currents. Burn-outs do not affect it, and if it can be kept dry, which is the great difficulty attending its use, the conductors which it insulates will have a high insulation resistance and a low electrostatic capacity—two things which are of the greatest importance in electrical engineering.

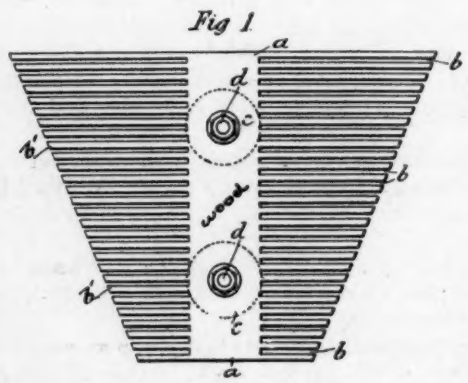
Chandler's Patent Gas Washer or Scrubber.

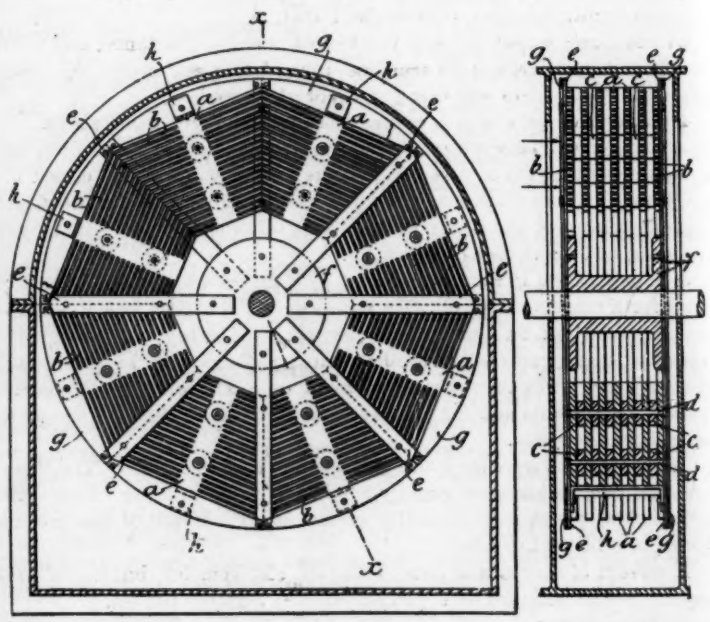
On November 29, 1892, U. S. Letters Patent (No. 486,297) were granted to Mr. Josiah C. Chandler, of Brixton, England, for an improved gas scrubbing or washing device. This patent is supplemental to a somewhat similar device, which was secured to him by Letters Patent (No. 406,124) dated July 2, 1889. In the last mentioned apparatus the wetted surface against which the gas impinges is composed of bundles of laths. In the current system, however, using the words of the specification:

According to my invention, instead of employing laths, I make use of boards having therein a number of saw cuts or slits for affording a large amount of wetted surface. In practice a number of such boards are advantageously made up into a bundle, suitable distance-pieces being placed between them.

To enable my invention to be fully understood, I will describe the same with reference to the accompanying drawings, in which—

Figures 1 and 2 are side and end views, respectively, of a bundle of my boards adapted for use in gas washing or scrubbing apparatus of the kind in which the gas passes horizontally through the same—as, for instance, in the apparatus described in the specification of Letters Patent No. 199,450, dated January 22, 1878. Fig. 3 is a sectional elevation showing how the said bundle may be held in position in the washing apparatus; and Fig. 4 is a section on the line *x x*, Fig. 3. Figs. 5 and 6 are views similar to Figs. 1 and 2, respectively, showing the arrangement of the boards when the gas is caused to pass through them from the center toward the periphery—for instance, as described in the specification





of Letters Patent No. 206,736, dated August 6, 1878. Figs. 7 and 8 are a sectional elevation and a longitudinal section showing how the bundles in this case may be held in position.

Similar letters of reference indicate corresponding parts in the several figures.

a a indicate the boards; *b b*, the slits or saw cuts therein, leaving a series of fingers *b'*; *c c*, the distance-pieces between the boards, and *d d*,

bolts passing through the boards and through the distance pieces and serving to clamp the whole together.

In practice I advantageously arrange a series of segmentally shaped bundles, such as are shown in Figs. 1 and 5, to form disks, which are caused to revolve in order to retain the surfaces properly wetted in the usual well known manner. When the gas is to pass through the bundles in a horizontal direction, the boards are arranged as shown in Figs. 1 and 2—that is to say, side by side—so that the gas will pass through the various slits in the boards.

Fig. 5.

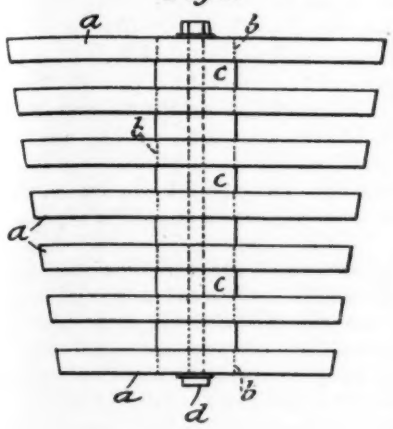


Fig. 6.

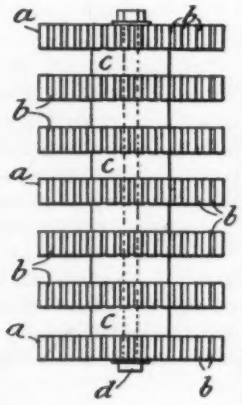


Fig. 7.

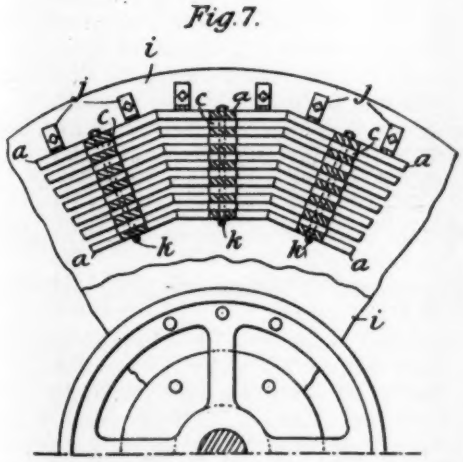
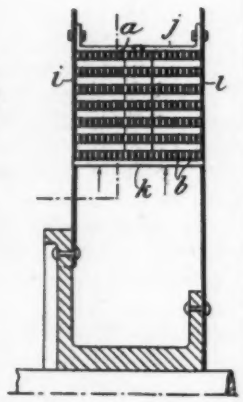


Fig. 8.



As shown in Figs. 3 and 4, several bundles are clamped between pairs of arms *e e* to form a disk, the said arms being secured at their inner ends to a hub or boss *f*, and at their outer ends connected by plates *g g*. *h h* are cross bars bolted between the plates *g g* on opposite sides of the bundles in order to retain the said bundles in their proper positions between the arms.

In the arrangement shown in Figs. 5 and 6, which is adapted for use when the gas passes radially through the bundles forming the disk, the said bundles are advantageously carried between two metal plates *i i* and held in place by cross bars *j j* and bolts *k*, as shown in Figs. 7 and 8.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A revoluble washer or scrubber for gas, consisting of a series of boards, each made of a single piece of wood having a series of fingers *b'*, extending in opposite directions from the center or body of the wood, as shown and described.

2. A revoluble washer or scrubber for gas, consisting of a series of bundles of boards arranged around a common center, as set forth, each board being made of a single piece of wood having a solid center and a series of fingers *b'*, extending from the opposite edges to such solid portion.

[Prepared by Mr. Walter Graham, for the *Colliery Engineer*.]

The Development of a New West Virginia Coal Field.

There is much to interest the readers of *The Colliery Engineer* in the new coal field just opened. The extension of the Norfolk & Western Railroad to the Ohio River has been completed, the North and South are bound together with new bands of steel, and Ohio and Virginia are neighbors.

I have before me as I write the "Prospectus of the Southeast Railrord of West Virginia," dated 1884. It suggests that very much the same line of railroad as the above should be built and thus complete the chain of standard gauge railroads from Norfolk, Va., and the Southeast Sea Coast, with the Ohio Valley and the lakes of the North; and states that such a line would be a hundred miles shorter than any other line (practicable) from the Ohio River to the Atlantic coast, and would pass through inexhaustible supplies of timber and gas, steam, cannel, and coking coals.

A Virginian endorsed upon this little pamphlet "the author of this is mad." What a striking lesson this is. It did seem, eight years ago, I suppose, a mad project to build a railroad through that wild mountain country, inhabited by the Hatfields and McCoys; but, since then, the great Pocahontas vein has become famous and millions of money have been spent, and thousands of coke ovens built, and a hundred thousand people have found new homes in that time, within a radius of a few miles from here.

Now there is open to us 150 miles of the lower and middle coal measures, and a great unbroken forest of poplar, walnut, white oak, and other timber.

The coal seams are from 6 feet to 11 feet thick, No. 3, or Pocahontas, being 11 feet thick at Pocahontas, and the gas coal seams attain a thickness of 10 feet in Logan county. The cannel coal is reported to be 3 feet 6 inches to 4 feet thick in Logan county.

But we do not learn the true value or significance of this new coal field and timber region from looking at it merely as a storehouse for the North, the West, and New England. It is the greatest factor in the development of the South. Upon it is based the change of the South from an agricultural to a manufacturing country, and because of it the iron ores of Virginia, North Carolina and Tennessee are available.

We can best show this by describing the results already produced at Graham, Va. The business and industries of the town represent the resources of the region. Ten years ago a log cabin stood alone on the site. It is now the junction of the roads extending to Louisville, Ky., Columbus, Ohio, and Norfolk, Va.

In this little house the founder of the town, Mr. Thomas Graham, of Philadelphia, found shelter and studied the possibilities of a country containing coking coal and iron ore, within ten miles of each other, and planned the extension of the New River Railroad to a point that was afterwards named Pocahontas.

Now Graham is the new gateway between the North and South.

Lying in a blue grass limestone valley 2,500 feet above tide, with the Pocahontas coal vein only nine miles away on the north, and rich iron ores within seven miles on the west, and great forests near, she will hold one hand on the old established markets of the North, and with the other hand reach out for the new markets of the South as they grow.

On account of the poplar and hardwood forests, Graham bids fair to be a good working town; already a large saw and planing mill, a furniture factory, a handle and spoke works, and a sash and door factory are there; and two flour mills, and an ice plant, and some minor industries have been started, but the pride of Graham is the blast furnace of the Graham Furnace Company, which is a magnificent plant, and it obtains its coke, limestone, and a large part of its ore within a radius of ten miles, or within the minimum freight rate.

Fossil ore, remarkably low in phosphorus, is largely used, and the Cripple Creek, Gossan and Potsdam ores of southwest Virginia are brought back cheaply in returning coal cars.

For the following reasons a steel plant is projected: Cuban Bessemer iron ore can be brought very cheaply from Norfolk in returning coal cars, to be used with local ores, coke and steam coal and limestone are within the minimum freight rate.

Gas coal can be had cheaply. The refractory materials containing as high as 99 per cent. silica are near at hand.

It will be easy to obtain and domicile skilled labor in Graham, because of its schools and churches, its high altitude and surrounding rich limestone farm lands, and its proximity to Ohio. Both the Northern and Southern markets are near. One hundred trains, of which 14 are passenger trains, pass Graham daily. There is a very fine hotel there. Until recently the town has been on a branch coal road; now it is an important junction, and wholesale business houses are projected and the extension of the coal fields is making it a center for coal enterprises. The local offices of the Elkhorn and Sandy River Land Trust and the Logan Coal and Timber Association, which own over 40,000 acres of coal and timber land, mostly in McDowell and Logan counties, have been opened there. The new railroad passes immediately through these lands which contain Nos. 3 and 4 seams of steam and coking coal of the lower measures, and seams of steam, gas and cannel coals of the middle

measures. These veins are being opened and developed with the diamond drill, and most valuable leases of coal lands on royalty, immediately upon the railroad, are offered.

The following are analyses of the coals, with analyses of standard coals of other sections added for comparison :

	Pocahontas Coal. McDowell Co., W. Va.	Island & Mate Creek Seam, Logan Co., W. Va.	Connellsville Coal.
Water	.932	2.073	62.60
Volatile matter	20.738	34.008	30.107
Fixed carbon	73.728	60.071	59.616
Sulphur	.618	3.848	.784
Ash	3.984	0.831	8.233

	Pocahontas Coke.	Connellsville Coke.
Water	.19	
Volatile matter	1.17	
Fixed carbon	93 20	87.69
Ash	5.44	10.44
Sulphur, average of three samples	.597	.977

Analysis of the ash of Pocahontas coke :

Ash	5.79 per cent.
Silica	2.67 "
Alumina	1.84 "
Iron	.59 "
Lime	.29 "
Magnesia	.13 "

It will be seen from these analyses that washing is unnecessary, the coal being remarkably pure and clean.

As a steam coal, Pocahontas has no superior. It is now being used in preference to any other by swift going ocean steamships.

Pocahontas coke is declared by a number of furnace men to be equal to Connellsville, if properly made and handled. It is a purer fuel than Connellsville, but is rather softer.

The operators were at first careless in drawing the coke from the ovens, etc., but they have learned now to make it, and there is no question now but that as good coke is made in this field as anywhere in the world. It has been proved by actual practice that it carries a very heavy burden.

GAS COALS.

CONSOLIDATED LOGAN LANDS, PHILADELPHIA, Oct. 8, 1889.

THOMAS GRAHAM, ESQ.: Dear Sir—Below please find report of results obtained in the analyses of coals sent me :

No. 1, marked Ferrall, Lower Mate Creek, Logan County, W. Va.; 58 in. bed.

Volatile matter	39.010 per ct.
Coke	60.090 "
Ash	2.250 "
Sulphur	0.603 "
Fixed carbon	57.840 "

No. 2, marked Upper Lick Fork of Mate Creek, Logan County, W. Va.; 74 in. bed.

Volatile matter	38.830 per ct.
Coke	61.170 "
Ash	2.220 "
Sulphur	0.578 "
Fixed carbon	58.970 "

No. 3, marked Lower Lick Fork of Mate Creek, Logan County, W. Va.; 70 in. bed.

Volatile matter	37.570 per ct.
Coke	62.430 "
Ash	5.440 "
Sulphur	0.763 "
Fixed carbon	56.990 "

Very respectfully,
(Signed) JOHN MARSHALL,
Chemist of the University of Pennsylvania.

THOMAS GRAHAM, ESQ.: Dear Sir—The three other samples of coal assayed by me a few days ago—namely, Nos. 1, 2 and 3—do not furnish a good, compact coke. This is because of the large quantity of volatile matter contained in these particular coals; a coal containing over 20 per cent. of volatile matter rarely furnishes a good coke.

The above coals, however, are most excellent gas coals; the quantity of volatile matter furnished by them is very large, and the amount of sulphur which they contain is very small. The latter is of importance in the purification of the gas in the process of making illuminating gas, requiring less lime or iron oxide to purify the gas. The ash in Nos. 1 and 2 is also very small. Very truly yours,

(Signed) JOHN MARSHALL, University of Pennsylvania.

For comparison we add the following analyses :

	Westmoreland.	Penna. Gas Coal.*
Water	1.427	1.280
Volatile matter	37.521	38.105
Fixed carbon	54.921	54.383
Sulphur	.713	.792
Ash	5.418	5.440

The Elkhorn and Sandy River Land Trust and the Logan Coal and Timber Association have their lands immediately on the railroad, and, consequently, their properties are of most interest to anyone contemplating going into the coal or timber business there, particularly as the other lands previously opened by the railroad have all been leased, and as operators are required to build their own branch lines before opening mines back from the railroad.

I have dwelt on these lands also because of the variety of coal and timber that is found on them. The region is represented by these properties. That these seams of coal are valuable and are appreciated, is seen from the fact that several leases have already been applied for, some of the applications being from parties interested in mines in this section. These lands are covered with virgin forests of poplar and hard woods, indeed the growth of poplar is almost peculiar to this region, and because of the lack of railroad facilities until now no timber has been cut.

Applications are being received for the timber, and saw mills are being located, the coal and timber have an easy outlet, both to the North and West, and to the sea, and great markets have been opened by the new railroad. The timber and coal can be shipped to the sea, the Ohio River or the Great Lakes. Domestic and foreign markets are accessible.

The system of operation by which the coal can be sold to the Pocahontas Coal Company, and for which they pay as received each month, ensures the operators from bad debts, or the expense and uncertainty of finding a market, and requires practically no working capital.

This has been the secret of the success of the operations in this region, and fortunes have been and are being made.

The eagerness with which coal and timber leases are being applied for is the key note of the growth of the country.

It would be a revelation to many in the North, who have always felt that the wild West is the "new country," to visit this "new country" and find wealthy, refined families who have prospered in farming and the raising of export cattle, on rich limestone lands for many years; schools, churches, good laws, and proverbial hospitality. But a new country it is, as far as coal, timber and iron ore are concerned, and one that has the above advantages. It is close at hand and is beginning to supply its own markets, and is knocking at the door of the commerce of the land.

A Chinese Gas Well.

The *Annual Mining Records* (France), Volume 19, 1891, contain a full description of the brine and gas well of the province of Sze Chouen, in Western China, which produces annually, as nearly as can be estimated, there being no regular statistics, about 812,000 tons of salt, which is entirely derived from borings, the salt being accompanied in places by petroleum and natural gas, the latter being utilized for boiling down the brine. The most important centers of production are in a district about 80 square miles in extent, about 25 miles northwest of the town of Fou Chouen. The geological structure of the district appears to be somewhat complicated, but according to the author, a complete succession from Cambrian up to tertiary and post tertiary strata, which is recognizable in the following order :

	Meters.
Yellow sandstone tertiary	38 to 100
Red sandstone, Gray limestone, Ferruginous oolite, often with bituminous springs at	200
Blue and yellow sandstone, lias	270

At this level gas is found sometimes in small quantities.

Bluish gray marl, White limestone, Permian	330 to 600

These strata yield brine of a yellowish color and medium saturation (10 to 15 per cent. of salt).

Sandstone and limestone with coal	Carboniferous.
Brown shining shale	Silurian.
Black schist	Roofing slates.
Green schist	Cambrian.

*These analyses do not do anything like justice to the coals they seek to represent.—Eds. A. G. L. J.

Dark colored brine, of the higher strength of 15 to 28 per cent. of salt, is found below the last mentioned strata at depths varying from 930 meters to 1,100 meters, as well as the most important gas springs. As a rule, the upper yellow brine bearing beds are not found in these deep borings.

The system of boring is percussive, the cutting tool and sliding piece, weighing from 200 pounds to 300 pounds, being suspended by a rope, and lifted about 2 feet at a stroke, by a lever worked by groups of coolies acting as dead weight. According to the depth, from 2 to 10 men are required to lift the tool from 12 to 15 times a minute, the gangs being relieved at intervals of 10 minutes. The cutting tool has eight steel faced teeth, but without grooves, so that the detritus accumulates at the bottom of the hole. This is removed by a sludger, consisting of a cylinder of wood covered with deep notches arranged ladderwise, which is lowered into the hole and moved about by a jerking motion on the rope until the grooves are filled with the sludge. Usually a pit is sunk by hand to a depth of about 100 feet from the surface, and lined with blocks of stone, before the actual boring is commenced. The diameter adopted is from 9 to 12 inches, which may be contracted to 6 or 7 inches when it is necessary to line the hole through loose ground. The lining tubes are either large bamboos bored out, or are built up of half trunks of cypress trees fitted together by swallowtailed joints, which are covered by hempen cloth, waterproofed with a paste of lime and oil. This first covering is protected by a close serving of cord, with a thicker layer of the cement over all, the total thickness of the structure being but little less than the diameter of the hole. According to the nature of the ground, the length of these casing tubes may vary from 10 to 300 feet; but when more than 20 feet are required in one length the high derrick must be provided. This is made up of two legs of timber 40 feet to 50 feet high, with two diagonal struts, and a multiplicity of guy ropes, the use of iron being restricted to a minimum.

As may be imagined, the progress of the work is very slow, varying from a few feet per day in loose ground to an inch or less on hard rock. Some of the deeper wells have taken from 20 to 40 years in sinking, and have ruined several sets of adventurers in succession. The deepest actual boring—1,160 meters—has never yielded anything. Some three or four holes are above 1,000 meters deep, but the greater number are between 530 and 930 meters, in the Tsze-liu-tsing group. In the Kong-tsin group they varry from 330 to 660 meters as the most general depth, the shallowest being about 200 meters.

The accidents to which the borings are liable, and the method of remedying them are treated at length by the author, with illustrations of the tools employed, from Chinese drawings. These are generally similar to those adopted in Europe; but the construction is very different in principle, bamboo and string entering very largely into their composition, instead of metal. As a last resource, the method of pulverizing a lost tool is adopted and carried out with incredible patience. The removal of a tool weighing 300 pounds in this manner requires about 5 years' continuous work, night and day, of 32 men, at a cost of about £3,000.

The brine is brought to the surface by tubular buckets of bamboo, with a foot valve varying from 2 to 6 inches inside diameter, and from 16 to 140 feet in length. For the latter size used in the deepest wells, derricks for 90 to 120 feet are required, the highest in use being 164 feet. These are built up of beams of timber lashed together with bamboo ropes, and cost from £800 to £1,000. The bucket is lowered and lifted by a flat rope, 20 millimeters broad and 5 millimeters thick, formed of slips of bamboo united by hempen cords, winding upon a gin which is usually drawn by buffalos, 2, 4, or 6 of these being required according to the depth of the well; but in the shallower ones, the lifting is sometimes done by a windlass worked by from 2 to 6 men treadmill fashion. The load upon the rope in the deeper wells in some cases exceeds 30 cwt., corresponding to a stress of 9½ tons per square inch. The quantity of brine raised at each lift varies from 116 liters (25½ gallons), with the smallest bamboos, to between 620 and 950 liters (136 to 200 gallons) with the larger ones, and under the most favorable conditions from 2 to 4 lifts may be made per hour according to the depth. When the bamboo is raised to the surface, a cover is pushed over the top of the bore hole, the valve is lifted by the lander with an iron hook, and the brine runs into a reservoir.

The product of the deep wells is very dark colored, and often emits sulphureted hydrogen in sufficient quantity to be dangerous to the workmen about the top of the pits if it is incautiously inhaled.

In addition to salt, some of the wells yield petroleum and gas in variable quantity, the former is skimmed off from the surface of the water after it has been allowed to settle in the reservoirs. The product varies in quality from a pure white burning oil, to yellow, greenish, and black kinds of low illuminating power, and giving much smoke. All are, however, burned, as the Chinese have no knowleege of petroleum refining.

The wells being generally away from the salt works, the brine is carried to the latter either by hand, when the journey is short, or by conduits made of bamboos with chain and bucket lifting wheels for overcoming intermediate differences of level, when a greater distance has to be traversed. The boiling down is done in shallow cast iron pans about 4 feet in diameter and 1.7 inch deep in the center. The thickness varies from 1½ inch in the center to 1 inch at the edges, and the weight is about 1,000 pounds. The heating may be done by straw, wood, coal, or natural gas. The operation lasts from 12 to 24 hours, according to the intensity of the fire, and yields about 100 pounds of salt.

In the district of Fou Chouen, where natural gas wells are principally found, from 600 to 1,200 pans may be heated by a single well. The principal supply is obtained from depths of not less than 670 meters. It is mainly marsh gas, being less carburized than that obtained at shallower levels, which burns with a tolerably white flame, but is only got in small quantities. The top of the well is enclosed to a depth of 10 feet, by a wooden casing, as nearly tight as possible, and the gas is led by bamboo pipes into cemented reservoirs with domed roofs formed by inverted salt pans. From these reservoirs the distribution of the gas is effected by means of bamboos leading to the pans, a short length of iron pipe being attached to the end of each line. The actual burner is a perforated block of stone of a conical form about 1 foot high; the gas is introduced by a lateral pipe at the bottom, and mixing with air is burned at the top of the block over which the pan is placed.

The whole arrangement is very primitive and imperfect, nothing of the nature of a stop-valve being used anywhere on the line of pipes. When the workman wishes to extinguish the flame, he places a brick on the top of the burner; but the gas continues to flow without interruption, and disperses in the atmosphere. As, however, the work is done under open sheds, there is not much danger of explosions; but the smell of the gas is very prejudicial to the health of the workmen.

The salt pans are usually built by the proprietors of the gas wells, who lease them to salt makers at a rent of about £32 per annum. The yield to the proprietors is therefere large, but the duration of the gas is very uncertain. The above abstract of this paper is from the abstracts of the Institution of Civil Engineers.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We are indebted to a Memphis (Tenn.) correspondent for the following from that city, under date of Dec. 2d: "In the trial of the case of James Quinlan against the Equitable Gas Company, of Memphis, for $400 damages, yesterday in the Circuit Court some amusing testimony was adduced. The suit for damages was based upon Quinlan's complaint that the value of his property, a house and lot on Kansas Avenue, had been injured on account of its proximity to the gas works, from which an odor came that was intolerable to his tenants, and that by reason of this fact it had been impossible for him to keep the house rented. Mrs. Foster, one of the witnesses, and an ex-occupant of the house, testified that no one could occupy the premises with any degree of comfort. The food, she stated, all tasted alike. There was no difference between potatoes and bread, and with one's eyes closed, she stated, it would be an impossibility to tell what kind of food was being consumed. A rather peculiar feature of the case was the introduction of a bucket of tar and refuse from the gas works in court by counself or the defense. From material similar to that contained in the bucket it was claimed that this intolerable odor came, and that such material was allowed to remain about the works, to the great annoyance and discomfort of the people living in the immediate vicinity. The bucket was placed in rather close proximity to the jury, it being the purpose of the attorney to show that there were no grounds for a damage suit on account of the alleged offensive odor emanating from it. Unluckily, however, the opposite effect was produced. The members of the jury began to hold their hands to their noses, and, after standing it as long as they could, they begged the Court to have the offensive bucket removed. Col. Gantt, who is usually up to snuff, saw at a glance that the little bucket of refuse had caused him to lose his case. A judgment of $400 was rendered against the Gas Company."

Under the heading, "And the Meter Worked On," the New York *Tribune* recently printed the following: "There was fire in his eye that morning as he boarded an uptown elevated railroad train on his way to the office of the gas company. 'Ive got them this time,' he muttered savagely, 'and they will have a hard time in explaining the freaks of

that meter, I am thinking.' The clerk in the gas office came forward to attend to the wants of Mr. B. a few minutes later. B. was mad through-and-through now. He had worked himself into almost a rage by thinking of the outrageous charge which the gas company had made. 'See here,' he blurted out, 'if this company doesn't correct that bill I'll have the whole business indicted for highway robbery.' The clerk picked up the bill which had been so spitefully thrown, and examined it as calmly as if such outbursts were ordinary affairs. Then he went back and compared the bill with the books. He came back evidently in the same contented frame of mind. 'Well,' from Mr. B., and the word sounded like the report from a gun. 'The bill appears to be all right,' replied the clerk as calmly as before. All right! Great Jehoshaphat! See here, that bill, young man, is for about the same amount that I pay in the winter, isn't it?' The clerk examined the books again and replied that the last assertion was true. 'Exactly,' continued B., 'and in spite of the fact that my house has been closed up for three months, and not a soul has been in it, my gas bill is just as big as it is when my family is all at home. What kind of a way of doing business do you call that?' This was a rather tough one for the clerk, and there was a gleam of triumph in the eye of the customer as the clerk hesitated. Would Mr. B. have time to go up to the house with an inspector to discover the leak? 'Certainly,' he said, with the air of a man who has won an important battle, and then he made some sarcastic remarks about the 'leak.' Mr. B. and the inspector examined the meter, and sure enough since the last record had been taken it had gone on industriously at the same rate as it had evidently been moving for the last three months. Then they went on up into the house. No smell of escaping gas met them. The inspector examined the burners in the hall, parlor, dining room, kitchen and bedrooms. Everything seemed to be all right. He began to look mystified, while Mr. B. became more exultant every minute. Matches were lighted and placed near all the joints, but without effect. The leak still remained a mystery. 'It must be in the walls or ceiling,' said the inspector at last, 'and it must be found, or the whole blamed house might be blown up some day.' Mr. B. began to look uneasy. He opened the bathroom door, and the first thing he saw was a sickly looking flame of gas. The slats in the window blinds were partly open, and the sunlight made the gas flame look pale. But there it was, turned on almost full force. The inspector saw it at the same time. 'That's a 6-foot burner, and it is burning about 5 feet an hour,' he said quietly. Mr. B. looked foolish. He made a mental calculation. Five feet an hour, 24 hours a day, 30 days a month, and three months—a gas bill of about $15. He only uttered one word, and that began with a big D. Then he paid the bill and gave the inspector $2 to say that the leak was due to the carelessness of the servants in the kitchen."

On November 30th Mr. John P. Harbison completed his 37th year in the service of the Hartford City Gas Company, and for over two-thirds of that period he has been the practical manager of the corporation. Quite a record that, and one that points to the urbane gentleman's firm belief in the view that the rolling stone is not much of a moss gatherer—not that Harbison believes much in gathering moss; he prefers dollars—and usually gets them.

The regular dividend of $2.50 per share on the stock of the Portland (Me.) Gas Light Company was declared towards the close of November. It was payable on and after December 1st.

Mr. Crawford Livingston, the man at the helm of the St. Paul Gas Light Company, says there is no warrant whatever in fact for the statement recently made that that Company and the St. Paul Electric Light and Power Company were in treaty for a consolidation of their interests. He is of the opinion that nothing could be gained by the Gas Company from such a movement.

The Minneapolis *Journal* is our authority for the statement that the Minneapolis Gas Company proposes to expend $500,000 in plant extension and betterments during the coming season, made necessary by the increased demand for gas in that city. The additions will include a new holder rated to store 1,000,000 cubic feet. It will be of the 3-lift order, and will have a diameter of 150 feet. The three holders now in use will be enlarged to the point of doubling their present capacity. A 15-foot station meter is to be installed. The mains will also be added to, and a feature of this division of the improvement will be the placing of a long line of 30-inch feeding main through the business portion of the city, from north to south. The work will be completed next fall.

A certificate of consolidation of the Malone (N. Y.) Gas Company and the Malone Electric Light Company, resulting in the formation of the Malone Light, Heat, Power and Coal Company, has been filed with the Secretary of State. The Directors are: Nelson W. Porter, Frederick D. Kilburn, Martin M. Porter, Samuel A. Beman and Orin S. Lawrence, of Malone; John H. Findlay, of Ogdensburg, N. Y.; and William J. Morrison, of Fort Wayne, Ind. The principal office is to be in Malone, and the Company is capitalized in $50,000. The stockholders of the Malone Gas Company are to surrender 195 shares of stock of that Company, and receive in lieu thereof 165 shares of stock of the new Company. The Malone Electric Light Company stockholders are to receive twice the number of shares of the new Company for their shares of the old.

The hearing which was to have taken place in Boston, on the 2d inst., before the Massachusetts Board of Gas and Electric Light Commissioners, on the petition of the residents of the Dorchester district of Boston for a reduction in the gas rate, was postponed to December 22. The adjournment was granted on the request of the Hon. Moody Merrill, who represents the petitioners.

A movement looking to the establishment of a competing Gas Company at Montreal, Canada, is underway, as will be seen from the following petition handed to the Mayor for presentation in due form to the City Council:

162 James Street, Montreal, Nov. 28, 1892.

To His Honor the Mayor and the Aldermen of the City of Montreal:

Gentlemen—Whereas, it is in the interest of the city of Montreal and its inhabitants to be supplied with cheaper gas and of a higher illuminating power than at present manufactured and sold, and that the supply shall be sufficient to meet the growing demands of the city and suburbs, and having regard to clause 6 of the contract entered into between the city of Montreal and the Montreal Gas Company, which reads as follows: "6. And the city of Montreal aforesaid, during the said 10 years, that is to say, from the 1st day of May, 1885, to the 1st day of May, 1895, shall not grant to any other Company or parties the leave to open the streets or roadways of the said city of Montreal, except during the last two years of the present contract or agreement, when the said city of Montreal shall have the right to authorize any other Company, that may be formed or then exist, or any other parties, to lay gas pipes and erect works so as to be ready to undertake the contract on the 1st day of May, 1895, for the lighting of the city and the supplying of gas to the citizens, if necessary."

We, the undersigned, John Coates, member of the Institute of Civil Engineers, London, and senior partner of the firm of J. Coates & Co., gas and hydraulic engineers, of London, and Henry Sampson King, of London, Chairman of the Whessoe Foundry Company, Limited, Darlington, manufacturers of gasholders and gas plant, and of No. 162 St. James street, Montreal, having the intention to organize a company which will be in a position to tender for the supply of gas at the expiration of the said contract, make by these presents formal application to be allowed to lay gas pipes in the streets of Montreal after the 1st day of May, 1893. We have the honor to remain, gentlemen, your most obedient servants,

H. S. King.
J. Coates.

P. S.—We should add that in committee we shall be prepared to concur in a clause giving the city the right to purchase the undertaking, when established, for the benefit of the citizens in reduction of rates, following the precedent of Manchester, Birmingham and other leading cities in Great Britain.

It is said that the Nova Scotia Power Company has bought over the entire plant and business of the Halifax Illuminating and Motor Company, paying $200,000 therefor. It is understood that both Companies will be amalgamated with the Halifax Street Railway Company, and that the whole concern will be transferred to a Boston syndicate, which will construct an electric road.

Articles incorporating the Weber Gas and Gasoline Engine Company have been filed. The object of the Company is to manufacture and sell gas and gasoline engines and other machinery, and the capital stock is put at $65,000. The factory and warehouses will be located at Kansas City, Mo. The Directors are Messrs. George J. Weber, David C. McCarroll and Robert G. Weber.

The Lawrence (Mass.) Gas Company has taken possession of its new office quarters, at No. 256 Essex street. The rooms are furnishsd in oak and present a very handsome appearance. At the left of the entrance

is the private office of Agent Humphreys, while the open space at the right will be used for the display of gas stoves for heating and cooking. The east window will be devoted to exhibiting electrical appliances, while the west window will be used for displaying gas globes, burners, etc. The main business counters of the Company are in the rear of the room. The Lawrence *American*, in noting this change, says: "The history of this Company is one of prosperity. It was originally founded by the Bay State and Atlantic Mills Company, in 1844. A stock company assumed the ownership of the plant, and it was incorporated on February 13th of that year under the name of the Lawrence Gas Company. The first quarters of the concern were at the corner of Essex and Appleton streets, above the store now occupied by Hugo Biel. The offices were removed after a time to rooms above the Pemberton bank, and in January, 1890, the removal to the recent location in the Merchants' bank building took place. Prosperity warranted the purchase of the Lawrence Electric Light Company, in May, 1887, and in August, 1890, the Edison Electric Illuminating Company was purchased."

THE subscribers to the capital stock of the Washington Court House (Ohio) Board of Trade recently perfected their organization, and amongst those selected to manage its affairs we note that Mr. Jerome Penn, well known to the fraternity from his connection with the Washington Gas Light Company, was elected Secretary. The Board made no mistake in naming Mr. Penn for that position.

DR. E. W. SIEMENS, the celebrated engineer scientist of Europe, died at his home in Berlin on the 6th inst.

WE are told that the strike of the miners at the Malago pit, near Bristol, England, has now lasted over a year. The total cost for the year has been $41,365, of which the Miners' Federation contributed $27,125. The strike is not over yet. The dispute originated in consequence of the employers refusing to give one cent per ton for the introduction of locked lamps, instead of naked lights as hitherto. This, says *Engineering*, seems like preferring to run a risk with the naked light, unless bribed with the trifling amount of about 4 cents per day. Doubtless there is a principle involved, because the mine owner is responsible for the safety of the worker; but the wisdom of a year's strike at the cost of between $40,000 and $45,000 is questionable.

MESSRS. J. GREEN & Son, who control the electric lighting supply of Placerville, Cal., in consequence of a considerable falling off in their business, announce a reduction in the rates that amounts to something like 50 per cent. over those that hitherto ruled. They now agree to furnish one "16 power lamp, all night, for $1.50 per month; same to 10 o'clock, $1; same for dwelling house, with privilege of lighting at any time of night, $1." The father and son, in further remark about the beauties of the Placerville system of electric lighting, say: "There is no dirt, no smell, no grease, no danger from fire, and no bother. All you have to do is push the button and we do the rest."

WE all have heard much respecting the great flow of natural gas that the residents of certain favored portions of California—notably those who have the right to pay taxes in Stockton—were favored with; but it looks that the stories concerning this wonderful good fortune were somewhat overstated. In any event, the following, which was forwarded us by a correspondent at Stockton, under date of November 26th, goes to show that Stockton's supply of natural gas occasionally is afflicted with an intermittent pulse: "Many natural gas lights in business houses went out last night, leaving the rooms in darkness for 20 minutes, when some of the lights burned as brightly as ever; but the Yosemite Club's rooms remained dark, and all efforts to relight the gas failing, the clubmen had to go home. The experts of the Company were called out to look after the trouble, but they could not locate it further than to say that air got into the pipes during the afternoon when the men were engaged in making new connections." The same old trouble—air in the pipes puts a gas light out in California, whereas the chronic kickers in our section of the country insist that it is a common practice with our illuminating gas companies to pump air into the gas for the avowed purpose of causing the "meter wheels to move faster." Could the difference between the air of California and, for instance, the air of New York, account for such varying results in the behavior of gas lights in the respective States?

THE Supervisors of Denver, Col., have been paying some attention of late to the electric lighting and water supply, on public account. At a meeting of the Board, held there perhaps a fortnight ago, Supervisor Van Horn offered the following resolutions:

"*Whereas*, It is rumored that a large number of superfluous incandescent lights and fire hydrants are now being maintained and paid for by the city of Denver, therefore, be it

"*Resolved*, By the City Council of Denver, that the Chairman of the Committee on Lights and the Chairman of the Committee on Water are hereby appointed a special committee to investigate said matters and report the same to the City Council at the earliest possible opportunity, with a view to dispensing with such superfluous lights and hydrants. And the City Attorney and Corporation Counsel are hereby requested to advise the City Council as to the power of the city to dispense with such superfluous lights and hydrants under existing contracts." A very amusing discussion followed the reading of the Van Horn document, one of the gentlemen admitting that all incandescent electric lights should be discontinued, so far as the public lighting of the streets was concerned, as they were not one-half so serviceable as gas lamps. Another gentleman admitted that he knew that "a number of hydrants were used as scratching posts by jack-rabbits," which at this distance would seem to mean that some of the hydrants were either out in the woods or in the stubble. Admitting that the location of the latter, "in some instances," is correctly specified, we beg leave to submit that even these hydrants are better worth their cost to the city than are, relatively at that, any of the incandescent lamps used in the street lighting. Incandescent electric lighting for street illumination is only fitted for the necessities of a village of the smallest class, and only then when it is impossible for such village to secure naphtha lamps at a figure 20 per cent. in excess of that which an electric incandescent service would cost. The resolutions were adopted.

MESSRS. FREDERICK W. CADY, HENRY BALLOU and others have petitioned the Providence (R. I.) Gas Company to extend its mains to the outlying suburb of Riverside. Although there are many difficulties in the way that would cause the expenditure on main account to be rather a large sum, it is likely that Mr. Slater and his associates will consent to the petitioners.

AT the annual meeting of the shareholders in the Franklin (N. H.) Gas and Electric Light Company, Mr. Walter Aiken was re elected President.

SOME days ago the Secretary of the Dedham and Hyde Park (Mass.) Gas Company received a letter from Chicago, enclosing a check in payment for gas, "as per statement rendered." Naturally he was put to thinking why a resident of Chicago wished to pay for—anything, we almost said—gas in a city other than his own, but he soon reasoned it out that the forwarder wished to make his peace with the Treasurer of the Hyde Park Gas Company of Chicago. The envelope address, however, was plainly enough, "Hyde Park, Mass."

IT is said that the Elersila Gas and Coke Company is preparing to erect, at Winifrede Junction, West Va., a plant for the manufacture of coke, with the further purpose of equipping the same for the recovery of tar, ammonia, etc., resultant in the operation of its coking works. The Company is capitalized in $125,000, and is said to be virtually a branch of the Winifrede Coal Company.

THE proprietors of the Company, formed at Crookston, Minn., some weeks ago, under the name of "The Crookston Gas Light and Heating Company," say that they have purchased the necessary land for the buildings, and that construction work will be commenced in March. The Company is capitalized in $100,000, and has some strong local interests behind it.

WE understand that the plant of the Williamsport (Pa.) Gas Light Company is on the market.

IT is reported that the New York Safety Car Heating and Lighting Company is in treaty with the Maine Central Railroad Company, for the purpose of lighting its passenger coaches by means of compressed oil gas, manufactured under the Pintsch system. The plant will likely be located at Portland.

AT the special election ordered by the Aldermen of Batavia, N. Y., to determine whether or not the city should own and operate an electric lighting plant (the first cost of the same not to exceed $21,000), 366 votes were polled, of which 140 favored the scheme and 196 opposed it.

THE Hicks Gas Engine Company, of Cleveland, Ohio, has been incorporated with a capital of $50,000.

THE Georgetown (Col.) gas works were slightly damaged by fire some weeks ago.

The Market for Gas Securities.

The market for city gas shares was not marked by anything of moment during the week, unless the continued upward movement in Equitable be taken as the impressive feature. Equitable is quoted at 167 bid, and although the nominal asking figure is reported at 170, we doubt whether an offer of 175 would bring out any amount of stock worth considering. Consolidated opened to-day (Friday) at 124½ bid, which shows a decline of 1½ points from the bid figure of a week ago. The shares are cheap, for the book value of the same is at least 10 points higher than the market rate. Mutual is steady to strong. One share of Mutual at auction this week brought 145. Standard holds its own. A dividend of 1 per cent. on Standard preferred was declared on Friday last. The details of the same will be found in our advertising columns. Central, of New York, is being inquired after very largely just now, but the would-be purchasers might as well bear in mind that Messrs. Beal and Munn, of the Company, are the gentlemen who have the main right to put a value on the shares. Now that his distinguished patient, the late Mr. Jay Gould, is no more, Dr. Munn can pay greater attention to his gas shares—not that he ever neglected to keep pretty close track of them. The Central Company has an excellent property.

The Brooklyn situation is still in the mysterious stage, and it looks to us that Mr. Addicks is floundering. In any event, some of his latest stage play in respect to the Brooklyn situation has the appearance of not having been carefully rehearsed. The old Brooklyn Company he is said to have under control, and now he is ostensibly aiming at the Metropolitan; but the Companies that he *must* have are not yet within range of his gun, nor are they to be brought down by a charge of salt and pepper. Williamsburgh is steady at 140, and Nassau, while bid for at 150, could not be bought at anything like that figure. Fulton-Municipal moved up sharply, and Peoples is all but at par. The chief jack-in-the-box just now in Brooklyn gas matters is broker Staples, who is rapidly assuming mental Metropolitan influence as a financier. Looking it all over, we imagine an interested public will have to wait until mid-January before the Brooklyn gas situation emerges from the fog. Meanwhile a depressing factor to outsiders is the fact that the Brooklyn gas field is pretty well stocked and bonded already.

Chicago gas is selling at 92¾ to 93 ex div., and Baltimore Consolidated is at 58 to 58¼. This stock is cheap. Lacledes are unquiet, and the same may be said of Bay State. The Equitable Gas Light Company, of Memphis, Tenn., has declared a dividend of 1 per cent., payable January 2. At auction this week 100 shares of Stamford (Conn.) Gas Light Company's stock sold at 73, and 2 shares of Metropolitan, of Brooklyn, brought 119.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

December 12.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	124½	125
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	167	170
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	143	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	35	40
Preferred	5,000,000	100	89	91
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	135	140
Citizens	1,200,000	20	113½	114
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co.	2,000,000	100	37	—
Bonds	1,000,000	—	—	85
Fulton Municipal	3,000,000	100	142	145
" Bonds	300,000		102	—
Peoples	1,000,000	10	99	—
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	118	122
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	150	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	140	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	88½	88¾
2d " " "	3,000,000	1000	77½	78
Bay State Gas Co.—				
Stock	5,000,000	50	56	57
Income Bonds	2,000,000	1000	77	78
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	92¾	93x
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	105	—
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	20	—
Bonds	600,000	1000	80	—
Cincinnati G. & C. Co.	7,000,000	100	192	—
Consumers Toronto	1,600,000	50	190	191
Central, S. F., Cal.			90	—
Capital, Sacramento, Cal			55	—
Consolidated, Balt.	11,000,000	100	58	58½
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	101
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn.	750,000	25	120	128
Jersey City	750,000	20	180	200
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	24	25
Preferred "	2,500,000	100	70	71
Bonds	9,034,400	1000	85	85⅜
Louisville, Ky.	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	40	—
" Bonds	240,000	100	103	—
New Haven, Conn.		25	200	—
Oakland, Cal.			40	45

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DIVIDEND NOTICE.

STANDARD GAS LIGHT CO. OF THE CITY OF NEW YORK,
71 BROADWAY, NEW YORK, Dec. 2, 1892.

The Board of Directors have this day declared a dividend of one (1) per cent. on the Preferred Stock of this Company, payable on Jan. 3d, 1893, to stockholders of record at 3 o'clock P M., Dec. 21st, 1892.

Transfer books will be closed from 3 o'clock P.M., Dec. 21st, 1892, to 10 o'clock A.M., Jan. 4th, 1893.

FERDINAND McKEIGE,
914-4 Secretary.

Proposals for Coal Tar.

THE LEBANON GAS COMPANY will receive bids for their **Tar Product of 1893**—making gas under the old process, from best gas coal. Two hundred and fifty (250) bbls. will be about the amount of the product. Bids will be opened Jan. 2, 1893. JOHN M. MISH, Treas.

LEBANON, PA., Dec. 1, 1892.

PROPOSALS

FOR AN

Electric Light Franchise.

DU QUOIN, ILL., Dec. 3, 1892.

Proposals for an Electric Light Franchise will be received by the undersigned at his office, up to 12 o'clock, noon, January the 6th, 1893, in accordance with Sec. No. 10 of Ordinance No. 96 of the City of Du Quoin, Ills., which is as follows:

"And it is further agreed with the said John R. Truesdale, his successors or assigns, that, if the said city or its inhabitants shall desire electricity for light or other purposes, the said John R. Truesdale, his successors or assigns, shall have the exclusive right to establish and operate a plant for such purpose or purposes, provided, always, he or they will furnish such electricity upon as favorable terms or conditions as may be offered by other responsible competing persons or companies. And in case he or they will not furnish it, then the city may grant the exclusive right to do so to other persons, companies or corporation"

Each proposal shall stipulate the maximum price to be charged private consumers, also the city, for both arc and incandescent lights; and no proposal will be considered unless accompanied with a $5,000.00 bond, or certified check, to guarantee the fulfillment of the franchise to be granted.

The city reserves the right to reject any and all proposals. The term for which the franchise will run will be until Sept. 17th, 1909.

(Signed) F. V. NETTLETON,
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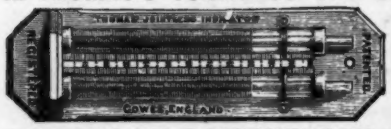

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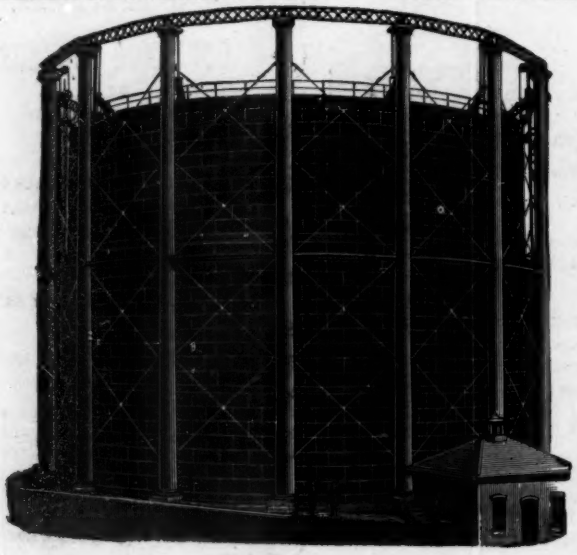

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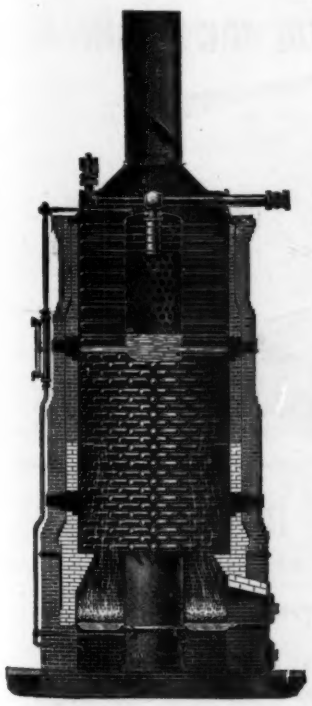

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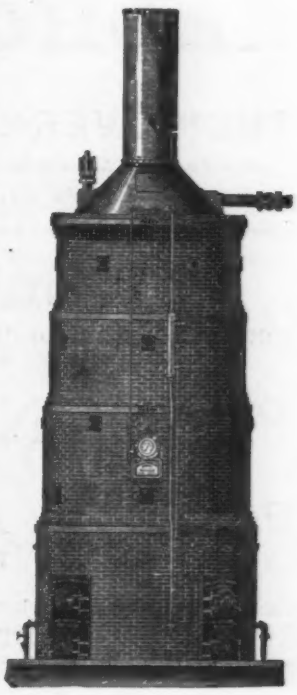

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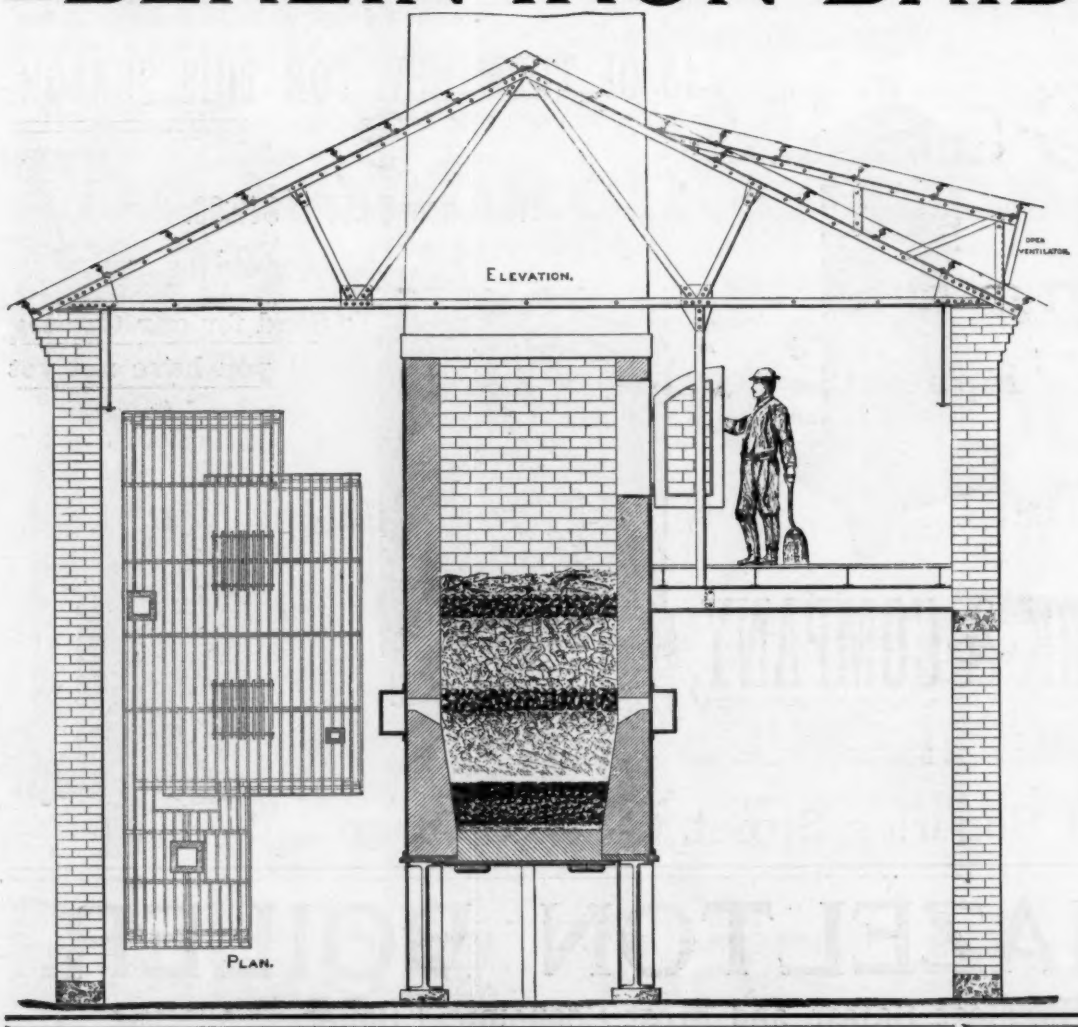

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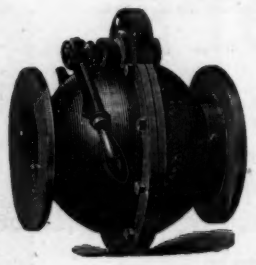

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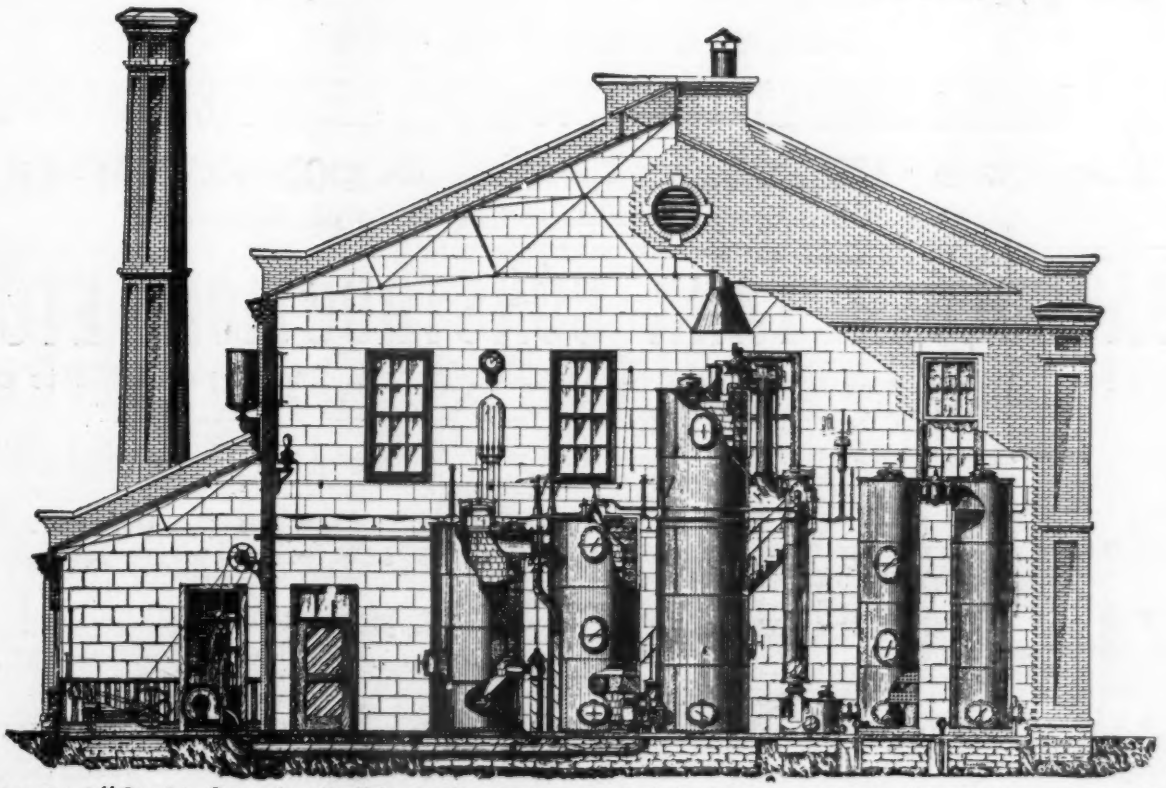

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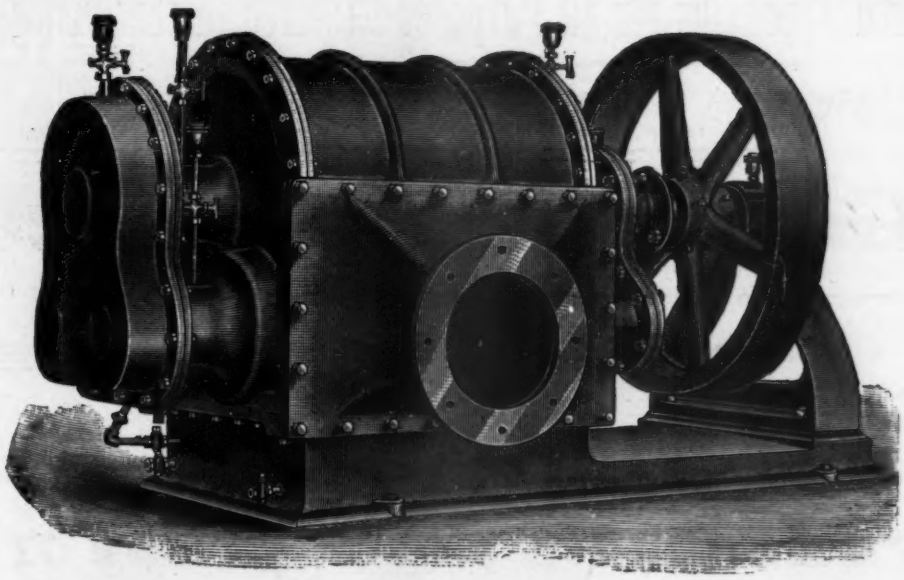

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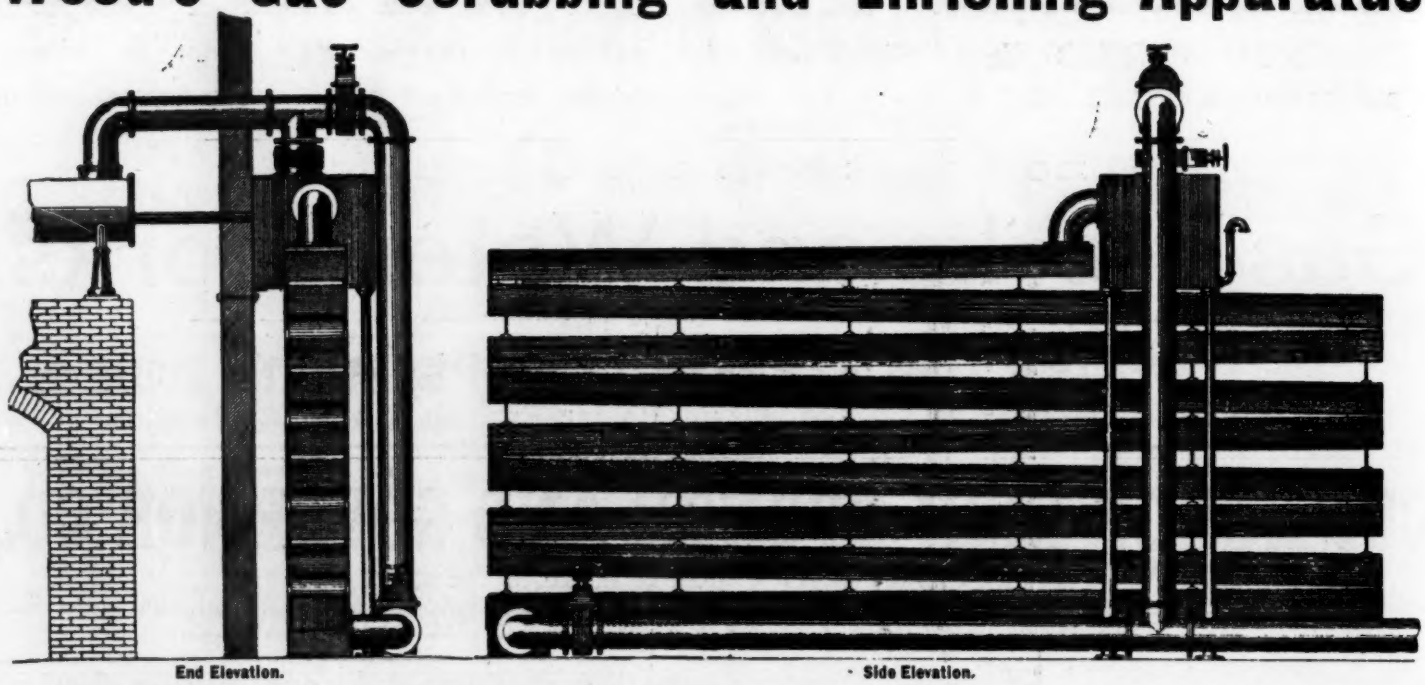

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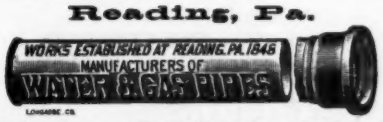

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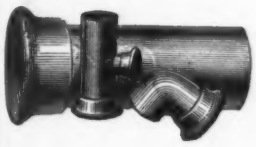

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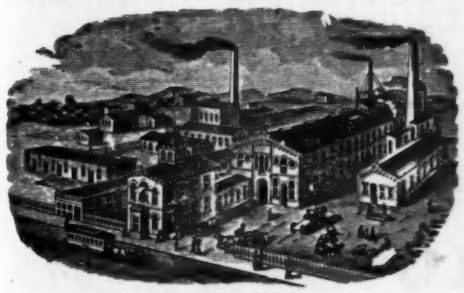

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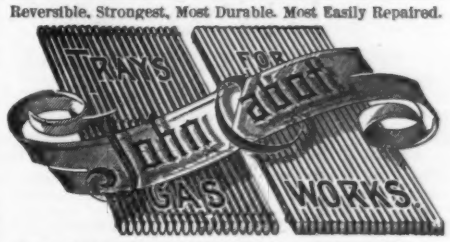

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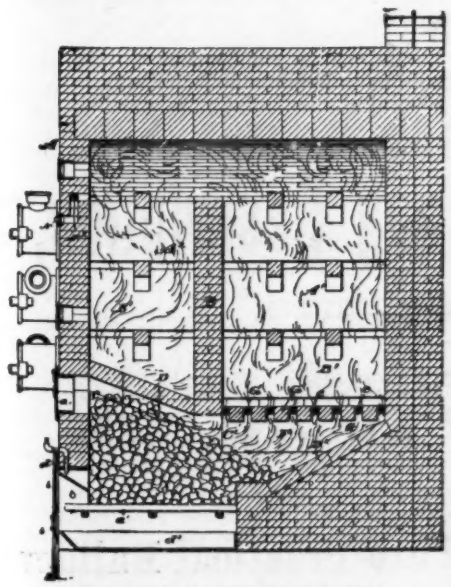

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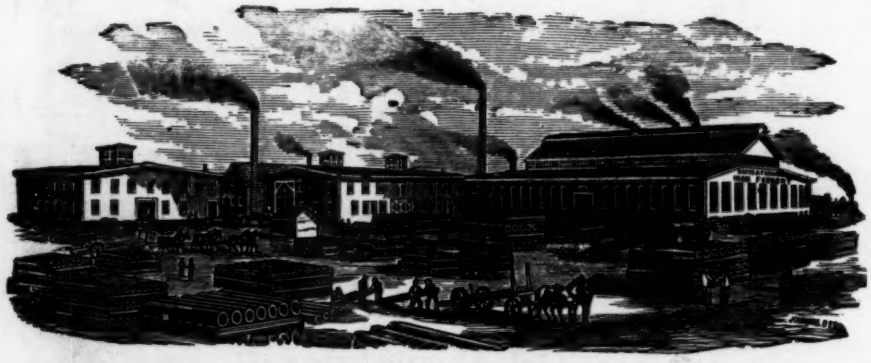

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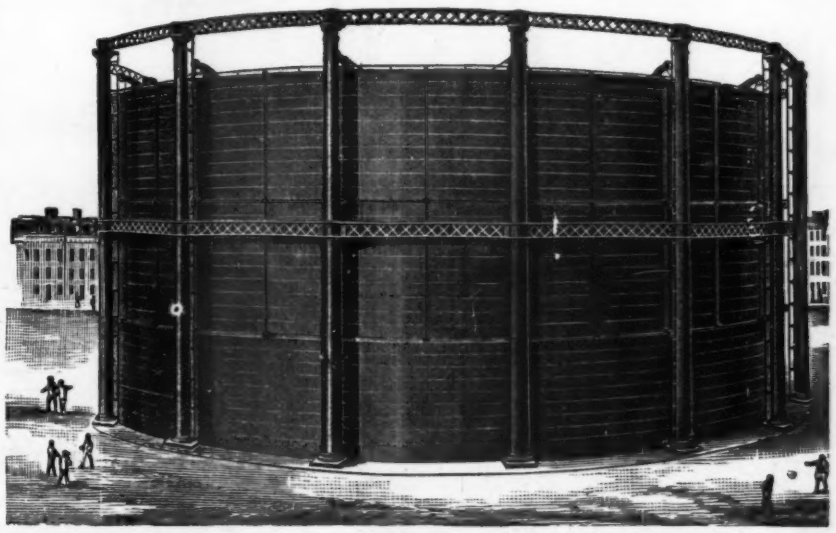

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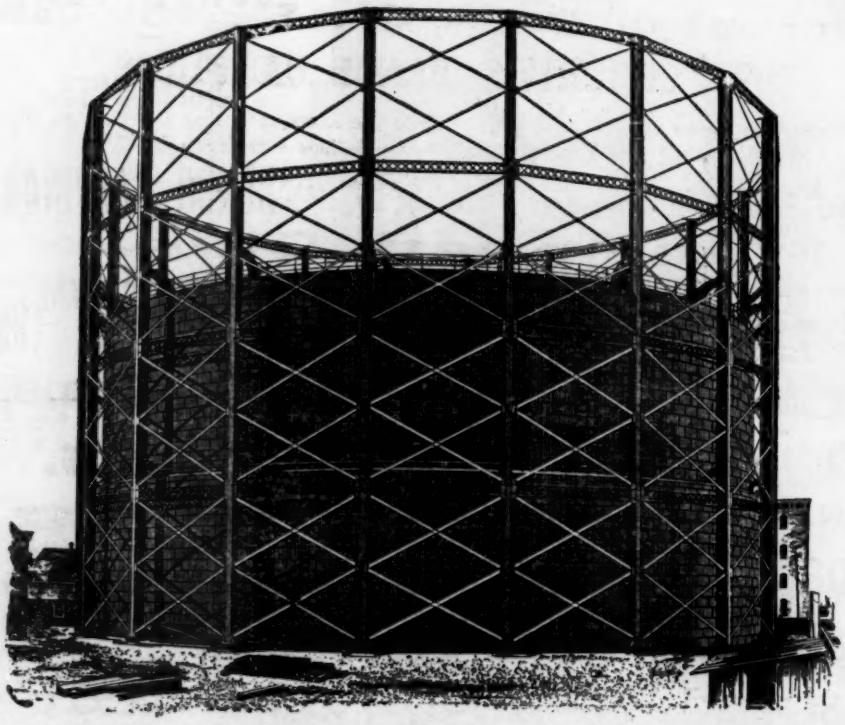

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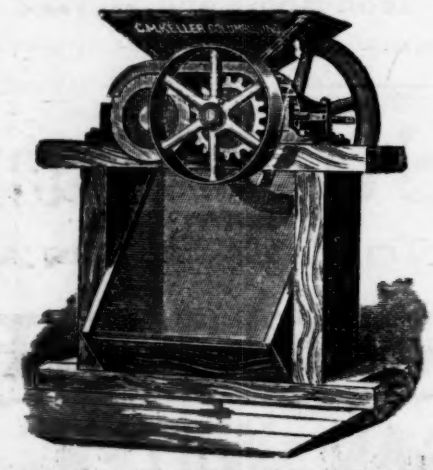

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